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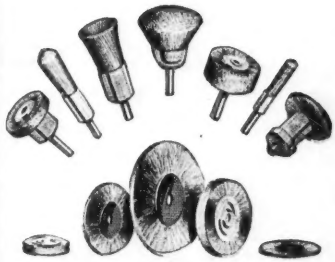

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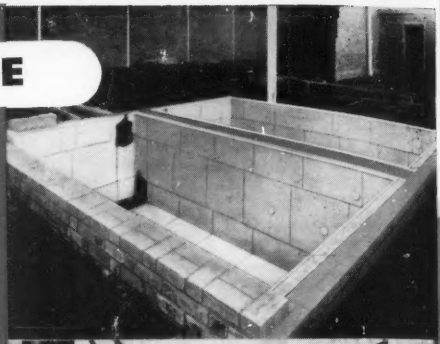

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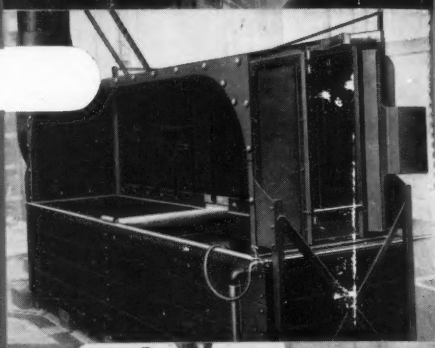

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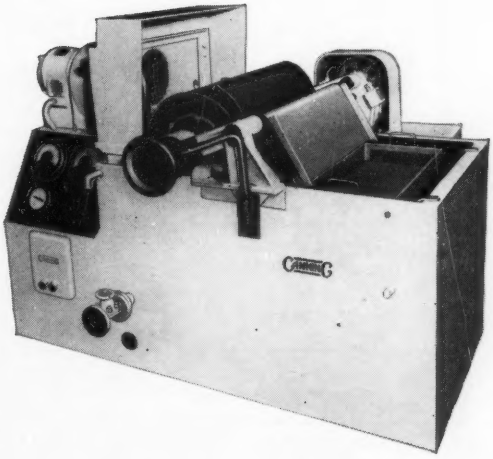

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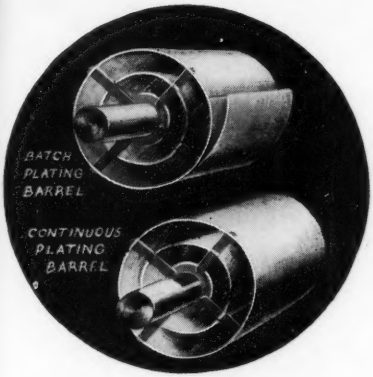

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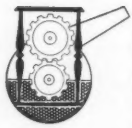

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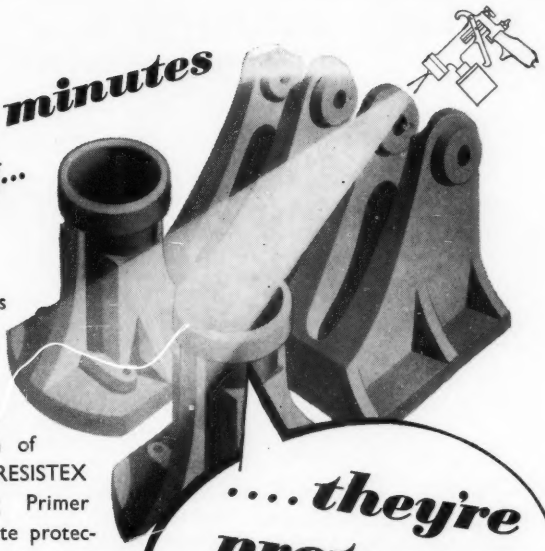

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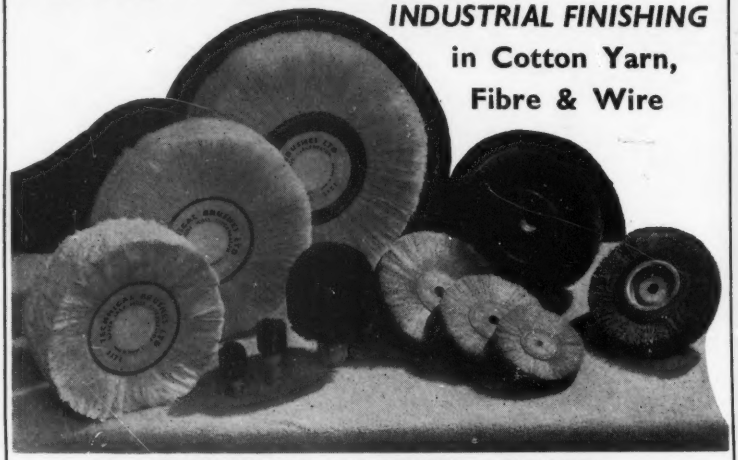

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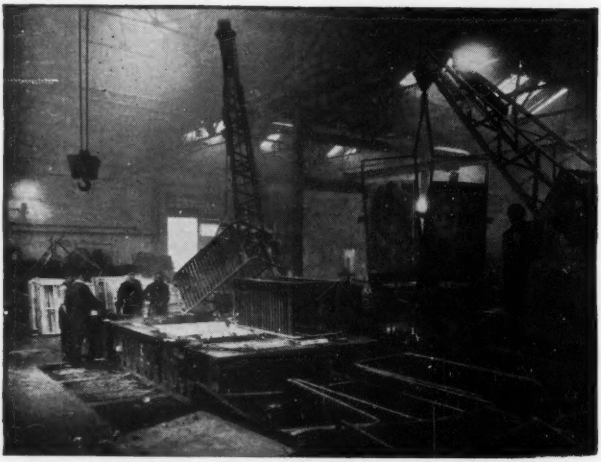

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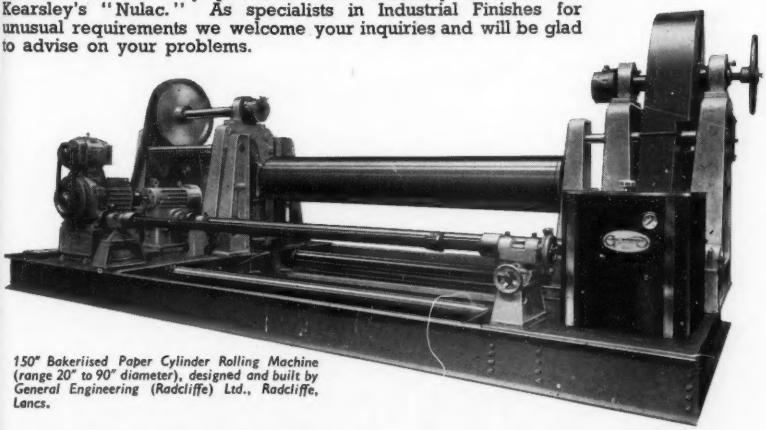

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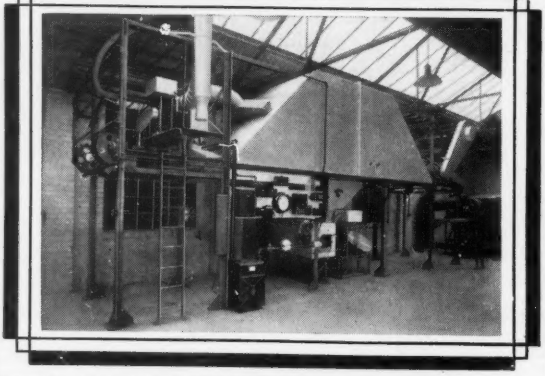

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Industrial Finishing

VOL. 5 AUGUST, 1952 NO. 50

FINISHING COSTS

IF there is one general agreement between the Opposition and the Government Benches, it is that the costs of British products must be reduced. This necessity of meeting overseas competition in order that materials and food can be purchased is not indeed likely to improve British living standards but is a stark necessity if they are not to be unduly depressed!

Primarily, wastage of materials and wastage of manpower are aspects which are within the control of every organisation, and within the finishing industry there are many examples of waste in both directions. The volume of individual handling of components in the finishing shop is still a tremendous drain upon industry. The paying of craft wage rates to an operative for walking from place to place in the course of his job instead of bringing the work to the operative is another case in point. There are still many thousands of gallons of paint wasted annually.

In the electroplating shop the amount of individual jigging and jig carrying is immense.

The obvious retort of many production organisations is, of course, that the cost of installing the plant necessary to eliminate both wastage of materials and wastage of labour is extremely high, and although some palliatives have been offered by the Government towards encouragement of capital investment in these fields it is still woefully small. This is fundamental and affects the Chancellor of the Exchequer, who must make a move in this respect if he wishes industry to rationalise itself. The question of fuel wastage is immense. The incentive offered to the smaller industrial organisations, which between them use most of the fuel, to encourage fuel conservation is again very small indeed.

It has been repeated and repeated that finishing is the outward presentation of an article to its prospective customer—it is the first impression the customer receives and the success or failure of an article is often judged by the ability of its finish to stand up to usage. It is wrong to imagine that finishing is a cheap process to get good results. It is costly both in materials and labour and in the overall field of industrial economics there is great need for encouragement of capital investment in the finishing trade to encourage the installation of plant and equipment necessary to save the present wastage of both materials and labour and thereby to reduce the cost of the ultimate job.

AN INTERESTING MERGER

by ARGUS

THE recent announcement that Pinchin, Johnson and Associates, Ltd., together with Lewis Berger and Sons Ltd., and Petrochemicals Ltd., were more or less jointly to manage the newer firm Styrene Co-Polymers Ltd., came at first sight as a surprising move. As someone mentioned whimsically, "Who would have thought to see the two Williams lying together in the same bed?" Undoubtedly on the paint side both Berger and P. J. between them control a very high proportion of the paint manufacturing industry. On the other hand both have been responsible for a tremendous amount of research and development leading to the use of styrene and styrenated alkyds in the paint industry, and their conjoint patents form quite a considerable bloc.

Several Deductions

Up to the present both organisations have continued to sell against one another, and no doubt will continue to do so in the future.

Yet one can draw several deductions from the merger. Both of the firms obviously think that styrene in the paint trade is something of worthwhile advantage. Perhaps, on the technical side, therefore, the strongest support to the potentialities of styrenated paints is drawn from the move.

Secondly, the ambitious scheme at Partington operated by Petrochemicals Ltd., in their Catarole process for cracking petroleum is, like all grand schemes, taking time to arrive at completion and has cost, through rising prices, much more than was thought in the first instance. The guaranteed demand for paint resins from the productive organisations of P. J. and Berger will undoubtedly result in a great reduction in the price of these resins, and the new 4,500 gal. reactor for the manufacture of styrenated alkyds is a testimony to the move. It is claimed to be the largest reactor ever installed and should be ready in about a year's time.

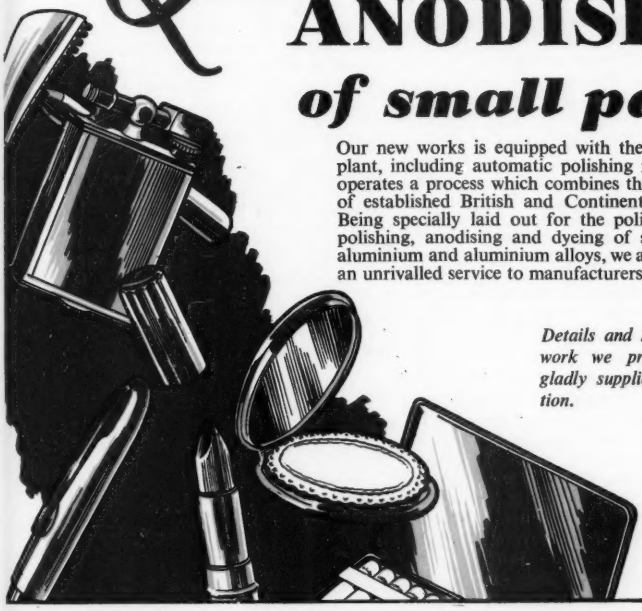
The interminable personal interconnection of paint people is very much brought out in the merger. Mr. W. J. Derby, managing director of Lewis Berger and Son Ltd., and Mr. E. A. Bevan, managing director of Styrene Co-Polymers Ltd., pioneered together early developments of oil modified alkyds for the surface coating industry in the 1930's, when of course they came in contact with Mr. W. T. Branscombe, now the managing director of Pinchin, Johnson and Associates Ltd., when he was then works manager of the P. J. Minerva works at Silvertown. With the envisaged growth of alkyds P. J. in 1933 engaged Mr. Bevan to work in collaboration with Mr. Branscombe in the manufacture of various products still produced at Silvertown today.

It is an interesting case of where the personal connection, the knowledge of one man of another over a period of years, does in many cases override the apparent paradox of competition.

Governmental Control

However, the broader issue of the merger is much to the fore. Whether we like it or whether we do not, the face of British industry is changing towards a greater degree of governmental responsibility. The days of complete independence of private limited companies are over—for even their largest shareholder, irrespective of size, is the Chancellor of the Exchequer! The only reasons which can be advanced for this governmental influence apart from security

Quality ANODISING of small parts



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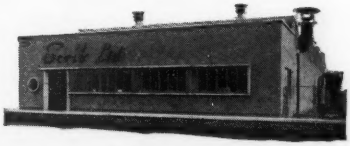

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has been increased service at reduced prices to the consumer by eliminating ruthless competition. Yet the present means employed of imposing this governmental control, as reflected in the fuel and transport industries, has hardly brought about the desired results. The Nationalisation Acts have been acts on paper, but their practical realisation has not been increased service at reduced prices—this is not necessarily a fault of the individuals who are trying their hardest to operate the industries, but is due to the inflexibility of parliamentary legislation attempting to cover too many individual human problems in an overall resolution. Obviously the ideal in the social revolution which is facing industry is to try and have the best of both worlds—that is to try and retain the drive, vigour and purpose of private enterprise whilst simultaneously ensuring that the private enterprise does not operate against the public interest.

Vital to National Economy

Here is, in this P. J.-Berger merger, a case whereby three large public companies have voluntarily entered into a relationship which seems the paradox of competition. Overall it is an experiment aiming towards the ultimate reduction in the price of goods to the consumer, to overseas buyers, and it is hoped, to the paint trade in general which is vital to the national economy.

There is no doubt the experiment will be viewed with interest, for if the merger can bring about this desired result it is an example to private industry of how it can preserve some of its individual character whilst simultaneously discharging some of the advantages claimed for nationalisation, but which have never been realised in practice. The hope of private industry thus seems to spring to an interlocking of interests even by rivals, whereby their overheads are correspondingly reduced, but their autonomy as an individual nucleus remains intact. It is an approach whereby the major problem of nationalisation, which is too much day-to-day executive responsibility vested in too few individuals, can be overcome.

Whatever may be said to the contrary, the Berger-P. J. relationship is a brave experiment in private business economics and all will look at it in this light, because if it does show signs of success, then all three firms deserve congratulations—which indeed anyone deserves in the name of any pioneering activity directed towards the solution of any fundamental problem.

BEHENIC ACID OFFERED

SINCE they came into production in 1950, Hess Products Ltd. have made a series of highly pure fatty acids on a commercial scale in their fractionating plant at Littleborough, as well as offering a wide range of normal grades of Stearine and fatty acids.

They now announce a new addition to their range with highly pure Behenic acid. This is a saturated fatty acid of C_{22} chain length and has the following approximate tests and composition:

Acid value	160-165
Saponification Value	160-165
Iodine value	3 max.
Titre	74-76°C.
Melting Point	76-78°C. (complete fusion, capillary tube)
Unsaponifiable	3% max.
90%	Behenic
8%	Stearic
2%	Unsaponifiable

It will be of interest to any company making waxes, chemical derivatives, metallic soaps, textile compounds, lubricants and any other products where a high melting point or long carbon chain length are necessary.

Samples and full particulars can be obtained from Hess Products Sales Office at 4 Albion Street, Leeds 1.

HIGH VACUUM COATING

WHILE still concentrating on production of industrial high vacuum plant, British American Research Ltd., Wishaw, Scotland, are working to meet a demand for a smaller type of plant for universities and laboratories, capable of melting 2-3 lb. of metal of a normal weight of 500 lb. per c. ft.

Vacuum coating work is expanding steadily; plastics, glass and mild steel are all being processed at Wishaw. The main industries concerned are the motor-car, jewellery, optical and metallurgical.

NICKEL PUBLICITY EXHIBITION

RECENTLY there was an unusual yet extremely interesting exhibition staged by the publicity department of the Mond Nickel Company outlining 25 years of publicity. The publicity reflects the fascinating story of Aronstedt, the Swede, describing his experiments in 1851 which led to the discovery of nickel—the adoption of the name, not an invention but identified with a particular type of ore; the frustration which followed experiments to extract useful metals in the mediæval days which was blamed on supernatural dislike of the investigation—the confusion surrounding nickel and its reference as "Old Nick's copper," from which the colloquialism "Old Nick" is probably derived.

It was not until 1883, whilst the Canadian Pacific Railway was being built, that rich crops of nickel ores were discovered. Then emerged that famous figure, Ludwig Mond, describing in 1890 to the British Chemical Society, the formation of nickel carbonyl from which nickel could be made. Yet it was not until the 20th September, 1900, that the Mond Nickel Company was finally registered in Canada. By then nickel steel was generally accepted as the best material for armour plate. Then, by 1905, there was stress on the use of nickel for coinage.

World War I created a new impetus but the disappearance of the armament market in the years following 1920 brought difficulties of a unprecedented kind. Fresh outlets for the metal were sought and by 1929, largely due to the pioneering efforts of the Company, nickel consumption throughout the world was about 60,000 tons—up till then an all-time record.

Again World War II increased the demand for high nickel alloys to astounding proportions particularly for reducing the wear and tear of machinery. Came Whittle's gas turbine and the need for a material for the turbine blades which would withstand high temperatures. Again nickel chromium alloys provided the low creep materials necessary to take the gas turbine engine from the drawing board to a working proposition. And in conclusion chromium plating, which depended up till the present at least, upon the relatively thick underlying nickel coat, came to the fore in the past 25 years.

In 50 years the fascination of the nickel story typifies the rate of technological achievement over that period—from 1900-10 the Company was trying to sell nickel and from 1945-52 it cannot meet current demands. In this deficiency is reflected the tremendous part played by nickel in practically every aspect of our technical life. This little exhibition takes one through the phases of the nickel story and in the pages of a book, "The Story of Mond Nickel," is outlined the background and origin of the now world-wide Mond Nickel Company.

Coal Tar Technology.—Volume 3, Part 2, covering July—December, 1951, of the "Review of Coal Tar Technology" is available from the Coal Tar Research Association, Oxford Road, Gomersal, near Leeds. Its price to non-members is 5s.

Our illustration shows Wild-Barfield gas carburising equipment, a note on which appears on page 53

Production Efficiency in Metal Finishing

By

H. SILMAN, B.Sc., F.R.I.C., F.I.M., A.M.I.Chem.E.

(President, Institute of Metal Finishing)

THE notion that high productivity is a desirable feature of the national economy and that the welfare, and indeed, the survival, of the country depends on it is now so widely accepted that it is difficult to realise that it is largely a post-war development. Only a little over a decade ago the outcry was against over-production and much thought was given to methods of "creating employment." The greatest national problem at that time was unemployment and the general principle of increasing output and reducing labour was looked on askance by large sections of the population, because they emphasised the twin evils of unemployment and over-production. In certain industries the memory of these conditions is still extant and colours the attitude of labour. The fear of possible under-employment even now hinders the introduction of mechanisation in some industries.

Emphasis on Productivity

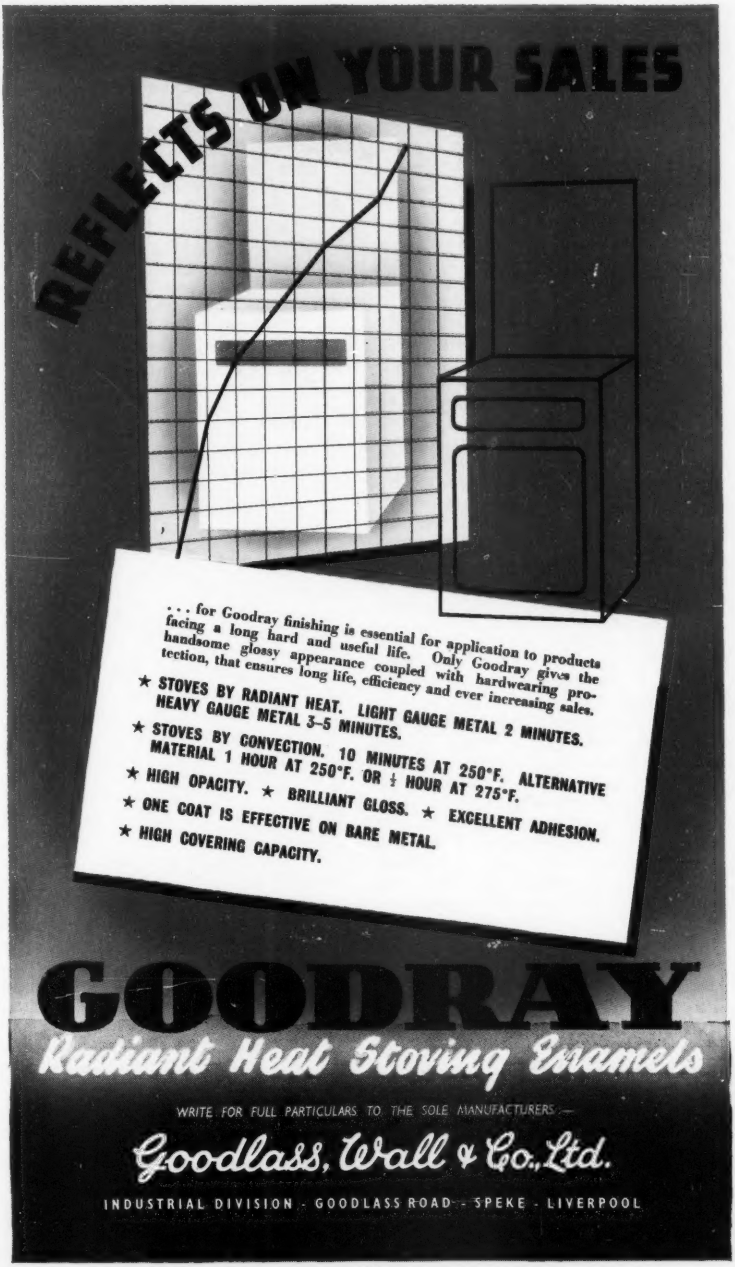
The emphasis in this country on productivity arose from the loss of overseas investments during the war and the need to export manufactured goods, and to a much lesser extent, raw materials in an effort to sustain the national economy. During a time when there was a world shortage of such goods export was not unduly difficult, and measures were taken to reduce the home demand by means of Purchase-tax and other restrictions in order to concentrate on exports. Provided an adequate surplus of essential raw materials was imported there seemed no reason to believe that as productivity increased so the standard of living and the financial stability of the country would improve an ever-rising scale, as more goods were "released" for the home market.

It must also be remembered that the export policy is a Government-sponsored one which manufacturers have whole-heartedly supported, but which has created great problems and much hard work for the industries concerned. In a period of scarcity the path of least resistance is to sell internally in protected and relatively non-competitive markets rather than to force one's way into the export field against severe competition and in face of all sorts of problems both commercial and technical. In other European countries where exports have not been fostered in this way, there has, therefore, been much less interest in productivity because the difficulty has not been to produce, but to sell. Indeed, in some countries the Government actively intervenes to prevent high productivity, in effect, by making it illegal to dispense with workers below a certain arbitrary figure when the volume of production falls. In this country and the U.S.A., trade unions sometimes adopt this rôle and may contrive to prevent the labour force from being kept in line with production requirements. In such circumstances, efforts to increase output per worker may be frustrated, unless there is close collaboration between management and employee organisations.

New Difficulties

With the reduction in export markets for manufactured goods and a thinning of home demand as essential post-war needs are met, it is becoming increasingly obvious that increased production, *per se* in a restrictive

(Address delivered to a joint meeting of the Institute of Metal Finishing and the Institution of Production Engineers at the Engineers and Shipbuilders' Institute, Glasgow on June 18th, 1952.)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. . . for Goodray finishing is essential for application to products facing a long hard and useful life. Only Goodray gives the handsome glossy appearance coupled with hardwearing protection, that ensures long life, efficiency and ever increasing sales.
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★ STOVES BY CONVECTION. 10 MINUTES AT 250°F. ALTERNATIVE MATERIAL 1 HOUR AT 250°F. OR ½ HOUR AT 275°F.
★ HIGH OPACITY. ★ BRILLIANT GLOSS. ★ EXCELLENT ADHESION.
★ ONE COAT IS EFFECTIVE ON BARE METAL.
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economy, may not only fail to solve our problems but create new difficulties. A large number of countries throughout the world are now endeavouring to export more than they import. If these imports and exports are carefully balanced in nature the situation might conceivably become stabilised, but this is by no means likely.

Raw Materials

A further complication so far as our own position is concerned, is the shortage of raw materials. Just as in not a few cases national economic policy has misfired due to a tendency to base it on the assumption that a world shortage of many goods would continue for longer than it has done, it would be equally unwise to assume that the shortage of some raw materials will continue indefinitely. All forms of long-term planning by nations or individuals to counteract continuing shortages of either raw materials or manufactured goods must inevitably be based on facts and figures supplied to the planners. Once a shortage develops, however, there seems to be no means of establishing its exact extent or how long it will last. The reason is that everything conspires to exaggerate the deficiency. Such factors as over-ordering, increasing of stocks, and the concealment of production and demand figures, even if carried out to only a small extent by each sectional interest will in the aggregate tend to invalidate practically every conclusion that may be arrived at. Shortages in practice do not last for an inordinately long time because human ingenuity and resourcefulness assert themselves and the exploitation of hitherto uneconomic or new sources of supply tend to be developed and alternative materials may be introduced. It is, of course, important that there should be an adequate incentive for those undertaking such developments to make them worth while. Where prices are allowed to find their own level, shortages tend to be overcome more rapidly than where they are fixed, because these rise to such a level that the less essential users are automatically eliminated.

Once a shortage begins to be overcome a surplus develops with remarkable suddenness, as we have seen lately in many instances. Prices begin to fall and those having surplus stocks begin to sell to avoid financial loss. It is, then, not unlikely that the extent of the surplus may be equally difficult to estimate and may be much smaller than appears to be the case.

When artificial restrictions are imposed on the use of materials in short supply by Government edict, more complex situations can occur. Owing to the comparative slowness with which Governments act, restrictions can remain in force long after the need for them has gone. This has happened with certain metals, where the producers are faced with the difficulty of selling their mounting stocks to a limited number of authorised users. Under such conditions overheads rise and so do costs of production, whilst unemployment can occur in the producing industries. Where manufacturers have been compelled to produce low-grade articles because of a prohibition on the use of materials essential for the maintenance of an adequate standard of serviceability, the problem of selling accumulated stocks of such inferior goods becomes a serious one when the prohibition is lifted.

It has been seen time and time again that misleading conclusions have been reached as a result of inaccurate or inadequate data and for this reason it is a matter of considerable doubt as to whether the orders which have been introduced to save metals used in finishing operations have not done more harm than good.

Over-Government

It would probably be true to say that a substantial proportion of our present-day economic difficulties is a direct consequence of over-government. With each succeeding war, Governments have everywhere extended their grip on industry so that regulations succeed one another at an ever-increasing pace, and each one creates new problems which are inevitably tackled by the belated introduction of further regulations. Thus the problems of industry are complicated by the need of management to contend not only with the realities of manufacturing and selling difficulties, but with the often unpredictable and

arbitrary edicts of officialdom.

These general remarks on the economic consequences of productivity and its implications apply, of course, primarily to national and international problems. The prosperity of an individual industry or firm depends largely on the foresight with which the changing situations are met, and much depends on the flexibility and resourcefulness of an organisation. Within industry the question of productivity is important regardless of wider considerations because of the fact that the ultimate cost, and hence the saleability of its products are dependent on it.

What is Productivity?

What is productivity? It is a curious fact that productivity is one of the most difficult things to define, although almost everybody has a general idea as to what it means. One obvious way is to say that productivity is a function of the number of man-hours required to produce a certain quantity of goods. Again, one might consider the productivity of a firm or of a country as a factor, and relate the production in any given period to the output for a previous period, taking into account any changes in man-power. But these are excessively facile ways of defining productivity. Clearly, by mechanisation, for instance, the output per man-hour of a factory can be increased to almost any desired extent, the chief limiting factor being the capital which it is desired to spend. It is evident, therefore, that a simple increase in the output per man-hour of an organisation does not, in itself, mean that there has been an improvement in its efficiency. The increased production must be related to the capital invested in producing it, since such capital itself represents man-hours, although the labour is not directly employed. Thus, a figure for a productivity increase based on output per man-hour would only be true if no capital expenditure were involved in achieving it. As this is seldom the case, a modification of the index is necessary to compensate for such capital. Let us take an extreme example. It might be practicable for a firm of electro-platers to instal a machine to unrack components after plating which would reduce the labour on this operation from say, four operators to a single one. Such a machine would, in the nature of things, be a very costly one, but the productivity of the section would apparently increase fourfold. It would probably prove that this increase in "productivity" in this case would be pointless, and indeed, inefficient.

Of course, there are other considerations again. In recent years a great deal of mechanisation has been introduced in this country and to an even greater extent in the U.S.A., not because of the high cost of manual operation but because of the difficulty of obtaining specialised labour. Another reason has often been that a more closely controlled product has been obtained by the substitution of automatic machinery for manual operation. If the work of an essential section of a factory is held up by the absence of specialised skilled labour, mechanisation becomes cheap at almost any price. It is, thus, not an easy matter to prove the economic advantages of mechanising a particular operation especially in constantly changing circumstances.

Low Utilisation

With a reduction in the demand for manufactured goods and a degree of under-employment, firms which have installed machinery, expensive both in initial cost and in maintenance charges, may find that the increased productivity resulting from these installations has not been obtained because reductions in output have meant the low utilisation of large machines with correspondingly high overheads. Where similar operations are conducted partly by mechanical and partly by manual means, reduction in output can mean that the mechanised part of the factory has to stand idle to keep operators who would otherwise have become redundant in employment.

Skill and foresight are required in endeavouring to increase productivity by means of new capital equipment. Simple assessments of the time required for a machine to pay for itself or the availability or otherwise of labour are not in themselves sufficient. Hard and fast rules cannot be laid down and mistakes will be made.

On the other hand, any increase in productivity resulting from the more effective utilisation of existing plant and labour can be considered as a genuine one and this should be considered with the greatest care in every factory before any other steps are taken. Quite startling results have been obtained in the way of increased production from a given unit by a simple change in the layout of a shop without any further additions of plant or labour. The principles are well known; the ideal finishing line layout should reduce time and distance between successive operations to a minimum and eliminate handling as far as possible. In preparing a new or revised layout for a factory one of the most useful things to do is to construct a scale model of the scheme so that the relative advantages and disadvantages of various alternatives can be readily seen. Model making is slow and expensive but experience has shown that many snags in a production line can be seen in a three-dimensional model which are not readily detectable in drawings and plans. One should never be too proud to admit inability to visualise a proposed layout without a model; the consequences can be very expensive.

Flow Production

It is important that as far as possible all operations should be placed in a logical sequence so that flow production is achieved, the articles being processed moving constantly in one direction. In the case of plating processes it is the common practice to place manually-operated tanks in direct sequence. Where an operator has to use a series of plating baths and rinse tanks, these can be lined up on two sides of a gangway or in U-form so that walking distance is reduced to a minimum and there is no time lost in returning to the starting point of the operating line.

There are often, however, gaps in the flow due to the need for having some operations carried out away from the main line for one reason or another. A typical example is bright acid dipping, which is often done in a separate building because this operation is considered obnoxious and therefore cannot be put into the plating line. This attitude is based on the fact that chemical engineering practice, as applied to electroplating, has tended to lag behind the times. It is axiomatic today that there is no process used in plating or polishing which cannot be engineered so that it can be carried out in its logical place in the production line with complete safety. The principles of fume extraction and neutralisation are well known and the necessary equipment for carrying these operations out safely and conveniently are readily obtainable.

Modern pickling installations, both manual and automatic, are available which can be operated anywhere. If a calculation is made in order to determine over a period of years the maintenance costs of the conventional "dipping shed" and the overall cost in time and labour of taking work to it and back again, inclusive of damage and loss, it would be seen in most cases that the extra cost of a properly designed and ventilated installation put in its logical place in the finishing cycle would be a real economy rather than otherwise.

Handling and Factory Layout

One of the consistently expensive items in a finishing plant is the cost of handling. Twenty-seven productivity teams have reported that in the industries which they represented, the use of mechanical handling equipment in this country is behind American practice. They point out further, that all the equipment which they saw in use is available here. It has been said also that there are labour objections in Britain to the extended use of mechanical handling, but it is doubtful whether this applies to any real extent in the industries with which we are concerned. The simple fact that an article has to be handled at all is equivalent to an operation being performed on it, and there is also the risk of damage which is important in metal finishing. The cost of picking up and putting down is naturally greater when individual items are concerned than when the articles are being dealt with in bulk. The elimination or reduction of handling costs can be achieved by the introduction of various measures. Specially designed pallets can be made

Rockhard 444

IS A DOUBLE-PURPOSE FINISH

Rockhard 444—a comparative newcomer to the Gittings & Hills range of Industrial Finishes, has now firmly established itself with Manufacturers as a product with a double purpose—the two contributory factors being an exceptional adhesion to light alloys (particularly magnesium), tin plate, steel and cast iron, and high resistance to acids, alkalis, oils, solvents, and water. Furthermore, because of the absence of taste and smell, Rockhard 444 can be used with every confidence for the protection of food containers.

Rockhard 444 is based on an oil free Resin solution, and is recommended for use as a clear or Pigmented Finish. It can be applied by spraying, dipping or Roller Coating application, and may be used as a primer for normal synthetic stoving finishes.

Rockhard 444 will successfully resist Acetic Acid, Nitric Acid, etc., Sulphuric Acid (Battery Acid), Alkaline Solution, Alcohol and Ketones, Hydrocarbon Oils and Fats, Fruit Juices and Food Stuffs.

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for the transfer of work in progress which can be moved by fork-lift or similar types of power-operated trucks. These pallets must be light, cheap, easily stacked and compartmented to avoid damage to the articles being carried. The covering of steel and wire trays, bins, and pallets by treating them with plastisols similar in type to those used for the covering of plating racks has been found very useful in eliminating scratching of polished surfaces and can, partly at any rate, eliminate the use of wrapping paper which is a costly item and slow to apply and remove.

Whenever possible, conveyors can be used not only for bringing the work to the operator but also in the form of circulating storage conveyors for work in progress for which the operator is not ready. Such a system eliminates a great deal of wasted time and of labour in carrying boxes or containers of work from one place to another. Movement of personnel is kept to a minimum and less gangway space is required. There has been much progress recently in conveyor design and it is no longer necessary to have a long inclined portion to elevate the work from bench to travelling level. Conveyors are available which can drop down vertically to where they are required in the form of a narrow U-bend; they require rather more power than the conventional type but in many instances the advantages gained are well worth while. Plating plants with their different floor levels and narrow passageways are often unsuitable for the use of trucks, and conveyors offer a good method of reducing handling costs.

Factory Space Costs

Factory space costs are heavy and represent a substantial part of the total cost of production. The modern tendency to use single-storey factories has great advantages, particularly where the initial cost of building is concerned. It has, however, certain disadvantages as the horizontal distances involved in laying out the production line can be rather great. By putting some plant overhead, where there is sufficient height, extra working area obtained a low cost, whilst production lines can be shortened. With restrictions on new buildings and their high cost, this is a real and valuable way of increasing output per unit area of floor space.

In most works the possibilities of utilising overhead areas have hardly been touched. Rectifier installations are commonly put on galleries, but other units such as conveyorised paint stoving or drying ovens can be treated in this way or constructed vertically so that the floor space used is kept low. Conveyorised pickling and pre-treatment plants have even been successfully suspended from the roofs of factory buildings, with considerable reduction in the lengths of production lines. Where new lines are being installed in older buildings, flow production can thus often be made fully effective where otherwise it would not be practicable.

Basements can also be constructed relatively cheaply by means of modern excavating equipment; the judicious use of such basements for fume extraction ducting, filtration and pumping plants, etc., can be most economical and conducive to good factory layout.

Logical Sequence

In order to achieve an efficient factory layout for speedy production on modern lines, a number of preconceived ideas which have become almost dictionary words in the finishing world must be disregarded. In the first place the production line should take precedence over everything else; this means nothing less than the elimination of the plating shop, the polishing shop, the paint shop and the pickling shed as such. The significant operations must be located in their logical sequence in the line to maintain the flow of work. This means that all plants must be designed in such a way that they can be put anywhere in the factory. If certain equipment has to be segregated and located, in effect, where it will do least harm to the rest of the factory and machinery, the best layout for flow production cannot be achieved. This means that metal finishing units may be freely interspersed with any other type of plant, from milling machines to furnaces or power presses. At first sight this procedure is so obvious that it seems

strange that it has not been universally adopted in the past. The reason is that the method creates engineering and constructional problems which plant manufacturers and others have not been ready to tackle. Standards of drainage, ventilation and fume extraction for polishing and plating plants have to be much higher than when such units are put together in a special shop. Even hot water tanks have to be effectively exhausted, because one cannot allow volumes of steam to be liberated in the general factory. The extraction of large volumes of air from the factory in itself raises plenty of ventilating problems as the air taken out must be replaced by fresh air, warmed if necessary. Dust from polishing operations must be scrupulously removed as valuable machinery might otherwise be damaged and working conditions made unsatisfactory. This can be done more readily where automatic polishing machines are used than with manual polishing spindles because the polishing heads can then be shrouded more effectively. In dealing with these problems considerable additional expenditure may be involved but the advantages gained soon outweigh the initial cost.

One consequence of this policy is that automatic polishing and plating units must inevitably be relatively small in size if the maximum advantage is to be taken of the flow production system. Clearly the existence of a large centrally-located plating plant is not conducive to a good factory layout as work must be taken to and from it regardless of the layout requirements. The construction of several smaller machines in place of one large one tends to be a little more costly, as there is necessarily a duplication of instruments and other equipment. Also control of the plating processes involves more work, as more solutions have to be analysed. On the other hand, the plant is more flexible, and handling costs are greatly reduced. Furthermore, a plant breakdown, if it should occur, is less disastrous if alternative plants are available.

There are, of course, exceptions; where large articles all of a similar type are being plated and the layout lends itself, the installation of one or two large automatic plants may be the best method to adopt. Where, however, the products are miscellaneous and many manufacturing and assembly operations have to be carried out on them, small plants are much better. Similarly, small plants are most suitable for jobbing shops.

From the point of view of quality, small plants enable work to be segregated, thus avoiding the need for plating a large variety of components of different shapes and sizes together. This improves uniformity of plating and tends to reduce rejects especially in chromium.

(To be continued.)

INFLAMMABLE VARNISH

REFERRING to the four major fire incidents on passenger trains that have occurred during the last three years at Penmanshiel, Beattock, Huntingdon and Fordhouses, respectively, all arising from the use of inflammable varnishes on the interior of railway coaches, Mr. Nabarro, in the House of Commons, asked the Minister of Transport how many of the 25,000 corridor coaches at present in use had this inflammable varnish removed and how many were still in service.

Mr. Lennox-Boyd replied that 23,800 out of the 24,900 corridor coaches on British Railways had been examined; about 15,000 were found to be in order and about 8,000 contained these inflammable surfaces. "Of these," he said, "6,800 have been dealt with and about 1,600 are receiving or awaiting attention." In reply to a question by Colonel Gomme-Duncan as to who was actually responsible for "the most dangerous procedure of putting inflammable varnishes on the interiors of trains?" Mr. Lennox-Boyd said it was only comparatively recently that tests had revealed the possible danger of this material. "I do not think that anyone can be blamed for its use in the past. The important thing is to see that it is not used in the future."

W. G. Hiscock.—Dr. W. G. Hiscock has been elected a director of the Consolidated Zinc Corporation. Dr. Hiscock is a director and general manager of Imperial Smelting Corporation and National Smelting Co., and is also on the boards of Aluminium Sulphate, Avonmouth Farms, and Cuprinol.

AMERICAN TRENDS

by

A. L. PHILLIPS
(New York)

(EXCLUSIVE)

Steam Spraying

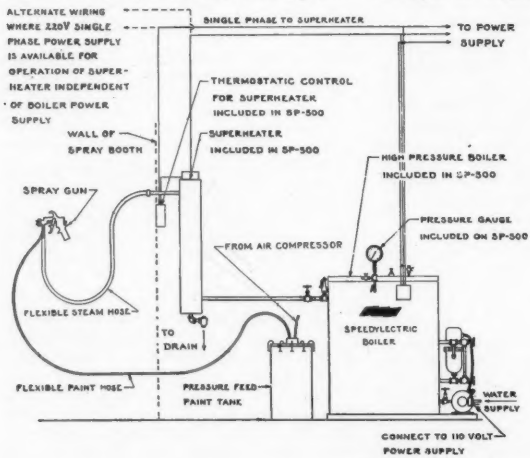
THE perpetual search for improved methods of paint application, the reduction of cost, labour, and the speed-up of the incidental operations has led to the investigation of many new processes. The objective is the application of thicker and better coats with fewer passes of the gun toward a theoretical ideal of a coating consisting of 100 per cent. solids and the elimination of thinners and drying agents.

This has led to the adoption by many companies of spraying at elevated temperatures, where the thinning medium is heat instead of solvents and thinners. The viscosity of the material has to be reduced to a spraying consistency and if this is done by heat instead of solvents, a much higher solid content will be sprayed and the resulting paint film will be proportionately heavier. By raising the temperature of the material the viscosity is reduced to a point where it is readily atomised and flows easily through the pipe lines.

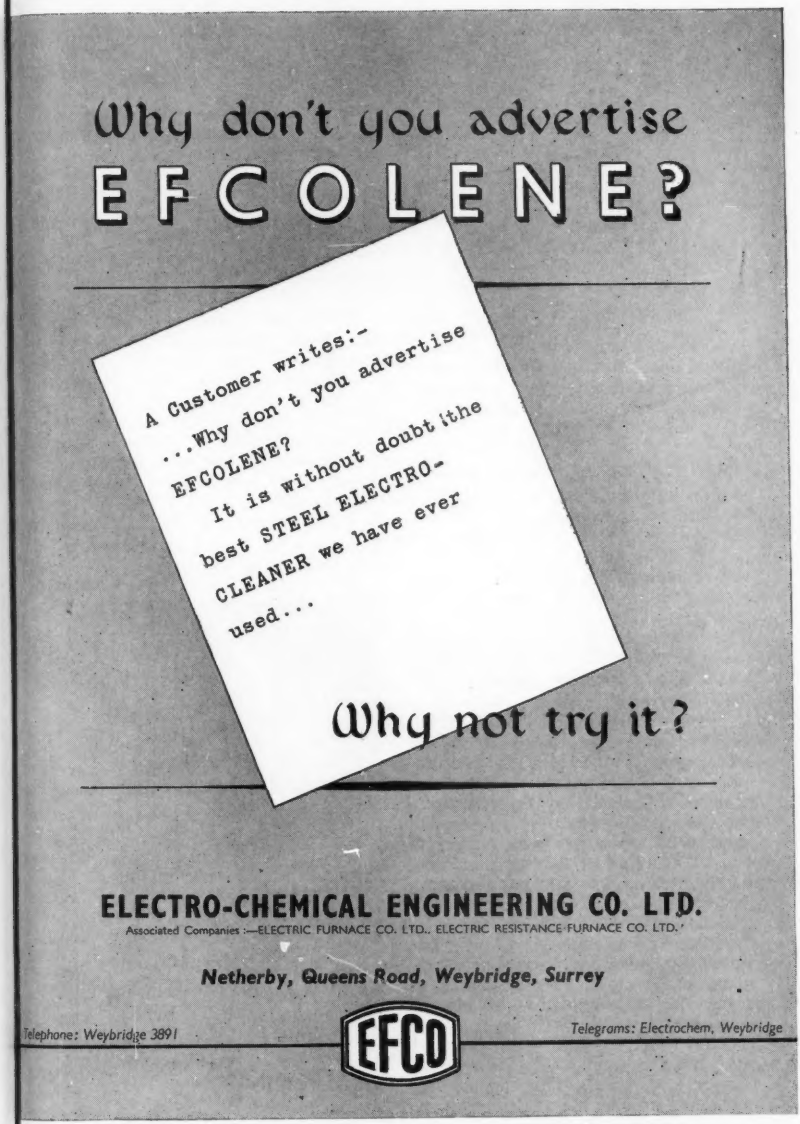
Another method has been devised now which uses superheated steam as the propellant and atomising agent. The obvious advantages of this are the elimination of compressed air and the equipment for heating the material. The steam combines these two operations with great efficiency and is said by users to be free from many of the complications and defects associated with conventional forms of hot spraying.

Considerable Savings

The process was patented and developed by E. I. DuPont de Nemours and Co., and covered by U.S. Patent 2,511,797, issued on 13th June, 1950. This is one of the first major departures from conventional application and promises widespread adoption in industries where the undoubted advantages of superheated steam can be


ALTERNATE WIRING WHERE 220V SINGLE PHASE POWER SUPPLY IS AVAILABLE FOR OPERATION OF SUPERHEATER INDEPENDENT OF BOILER POWER SUPPLY
SINGLE PHASE TO SUPERHEATER
TO POWER SUPPLY
THERMOSTATIC CONTROL FOR SUPERHEATER INCLUDED IN SP-500
WALL OF SPRAY BOOTH
SUPERHEATER INCLUDED IN SP-500
HIGH PRESSURE BOILER INCLUDED IN SP-500
SPRAY GUN
PRESSURE GAUGE INCLUDED ON SP-500
FROM AIR COMPRESSOR
FLEXIBLE STEAM HOSE
TO DRAIN
SPEEDYLECTRIC BOILER
FLEXIBLE PAINT HOSE
PRESSURE FEED PAINT TANK
WATER SUPPLY
CONNECT TO 110 VOLT POWER SUPPLY

Suggested layout of steam spray painting installation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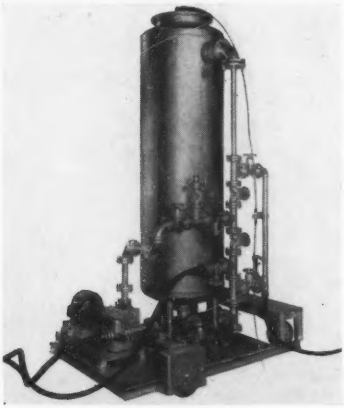
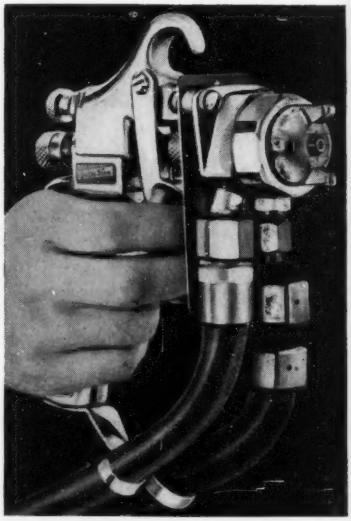


Equipment manufacturers are now in a position to offer "packaged" installations of high efficiency

adapted to their use. Those who are now heating their material to apply at elevated temperatures may find this the ideal propellant. Compressed air is not cheap, and steam is basically the cheaper. If there is available already a source of steam the advantages will be greater, but even in cases where the special equipment has to be purchased for the generation of steam, the savings are said to be still considerable.

The process has been made available to industry under licence. Equipment manufacturers have further developed the mechanical side of this process to the extent that they are now in a position to offer "packaged" installation units of high efficiency. It is a well-known fact that air is a highly inefficient means of atomising the material sprayed, and many methods have been tried to minimise the loss in overspray. The most economical pressure is considered by many to be about 40 p.s.i., for with a pressure as low as this the bounce is greatly reduced. However, pressures are used as high as 90 p.s.i. and spray efficiency, which rarely exceeds 65 per cent. at the best, is reduced accordingly. The higher the pressure used the greater the turbulence at the surface of the work. The rebounding air, when spraying with high pressures, diverts more paint particles from the work and causes more paint loss than from overspray. This is one of the many reasons for the introduction of steam into the finishing shop to replace compressed air. The best results have been obtained when operating at a pressure of about 60 p.s.i. At this pressure there is an immediate dissipation of the velocity energy of the super-heated steam and the rebound reduced to a minimum. Steam starts to dissipate and vaporise as soon as it leaves the gun, and the material is thus concentrated on the work and the resulting saving in overspray alone is between 10 and 20 per cent. of the material used.

The steam actually evaporates within a short distance of the nozzle of the gun, leaving the paint particles moving in a partial vacuum toward the object being sprayed. The rush of air to replace the evaporated steam literally propels the particles against the surface. There is no rebound because the original propellant has vaporised, and there is no slipstream to cause overspray.



A spray gun specially designed for steam spraying is necessary

A one-coat finish is possible when atomising with steam because the finishing material is greatly reduced in viscosity at the point of atomisation, and the consequent reduction of the thinners means a larger proportion of solids sprayed. This allows the application of heavier coats with a single pass, and this increased film thickness can halve finishing time in many cases.

Advantages

1. In most cases the actual material saved amounts to from 10 to 20 per cent. of the paint sprayed. This amount will be influenced by the conditions prevailing and the size and shape of the product.
2. The viscosity of the material is reduced by the superheated steam and greater film thicknesses may be obtained. It is possible therefore to obtain comparable results from fewer passes; to obtain a coating of the desired thickness in one application, or to obtain a multi-coat finish with half the number of coats.
3. The difficulty of "pinholing" and "popping" is reduced greatly. These defects are caused by air trapped by the paint and are minimised when steam is used as the propellant.
4. The finishes applied by this means are heavier in body and contain a higher percentage in solids and require considerably less thinning. The cost of reducing thinners is reduced and the heavier coats are obtained without the danger of "sagging" or "running."
5. Less overspray means that fewer booth cleanings are necessary.
6. The cost of generating steam is less than that of compressed air.
7. Labour costs are cut because fewer operations are needed to produce the number of coats necessary and the lessened booth cleaning time releases men for more productive work.

Quality

No outstanding improvement in quality is claimed, but many of the defects in paint films associated with conventional methods of application are absent when spraying with steam.

"Orange peel" is eliminated, and the air bubbles so often trapped between the paint film and the surface of the object no longer constitute a hazard to the finish. With steam spraying it is avoided because any steam trapped under the film immediately cools, creating a vacuum and causing the paint film to adhere firmly to the surface.

This method of paint spraying with steam is not new in conception, but its development as a practical industrial process is comparatively recent. The essentials in this process are the steam and the spray gun. The steam must be available sufficiently close to the operator to prevent a drop in the temperature of the steam through excessive hose length; there must be a constant pressure; and there must be an adequate supply for the number of guns operated. A superheater must be installed in the steam line as close to the gun as possible to ensure a supply of steam containing not more than 2 per cent. of moisture, and a separate superheater is required for each gun. If these conditions are observed the amount of moisture deposited in the paint film is insignificant.

Condensation

Condensation in the lines is the greatest threat to the finish and this is why existing sources should be tested carefully in order to determine the quality and suitability of the steam generated.

Steam spray painting units are available in capacities of from one to eight spray guns. Field tests have indicated that the best results are obtained where not more than eight spray guns are served from one unit. In this way the source of the steam can be located close to the spray guns and the hazard of wet steam caused by condensation in the pipe lines is thus avoided. Conventional spray guns cannot be used for this process. A spray gun specially designed for steam spraying is necessary. Many such guns have been marketed for this purpose and each manufacturer has incorporated his own exclusive features. One well-known company claims two outstanding features:

1. The weight is no more than that of a conventional spray gun.
2. There is practically no heat transmission between the head of the gun, where both the steam and

material inlets are situated, and the body of the gun.

Due to the insulation and heat radiating design that assures low trigger and handle temperatures, and the use of a built-in finger guard, continuous all-day use of the gun with the bare hand is possible without discomfort. A very useful feature of this spray gun is the hose support which reduces downward torque on the head and contributes to the balance of the gun.

Summary

Since steam spraying was introduced 2 years ago the equipment necessary for its adoption by industry has been developed with a rapidity that indicates the interest in the process.

There is little or no danger from burns although it is recommended that the operator wears gloves as a precautionary measure. The superheated steam cools so quickly that the operator can pass his bare hand through the spray at a distance of 12-15 in. from the gun without discomfort. Dry steam is the essential factor of the whole operation, and with care and the minimum of practice an operator can produce thicker and better coatings in less time and at less cost than when spraying with compressed air.

Pneumatic Drum Sanders

A new conception in polishing and grinding has been introduced. It consists of a wheel upon which an abrasive or polishing band rides on a cushion of air contained in a rubber drum. Different pressures on the drum and different grits provide varied surface finishes.

The drum can be deflated quickly and bands can be changed easily for grinding, sanding, or polishing. Pressures can be varied for contour grinding or polishing, and a much higher degree of accuracy and efficiency is claimed. When used on flat surfaces, up to thirty times more grinding contact area is possible. Pressure upon the air cushion flattens the drum, and instead of a narrow edge being in contact with the surface, contact is made over an extremely wide area.

One pass over a conventional hard wheel will give a narrow polished streak to a cylindrical object, but when such products are pressed against the pneumatic drum the flexible cushion adjusts itself to the contour of the product and thus covers an area six or seven times as great. This means that a curved object can be finished in one sixth of the time taken by conventional equipment.

The hand model has many applications in the finishing shop where individual parts have to be sanded or polished. They can be held in a vice while being finished, or in the case of a car, the portable sander can be plugged into the nearest outlet and used to follow the contours with the complete elimination of swirl marks.

The average pressure has been established at 3 lb., and for general work this will be found to give satisfactory results. However, only practice can determine the most suitable pressure required to give maximum efficiency to individual requirements.

Polishing Spoon and Fork Handles

Spoon and fork handles and similarly shaped products can now be surface finished by a machine designed to eliminate these time-consuming operations. The machine is not limited to silver ware, and allows batches of work to be transferred as units from one holding rack to another, between bowl and handle operation.

The practice previously in the industry has been to finish the spoon bowls, remove them from the racks, and then either resort to hand finishing or reload them in another rack for finishing the handles on another machine. This additional handling was time-consuming and made necessary an excessive number of re-works because of scratches and damage. The

batch handling method is claimed to speed up production and reduce the number of rejects.

The previous method was to transfer the loads from the bowl finishing machine, turn the racks upside down and place them in the handle machine. This operation has been eliminated by inverting the surface finishing rolls so that the racks do not have to be turned over.

In addition to silverware, the manufacturer claims that the machine is suitable for surface finishing plier handles, surgical instruments, carving forks, and many other curved items.

White Brass Plating

Webster B. Knight in an article in *Metal Progress* has thrown some new light on the above subject. There is little if any literature available covering the process and no single source or supplier can furnish complete data on its application. This new departure in electroplating is still in its infancy and is neither widely known or fully understood. White brass anodes are approximately 80 per cent. zinc, 20 per cent. copper; solution is of the cyanide type, and the best deposits so far are 0·0002 to 0·0003 in.

Advantages

1. Conventional nickel-plating equipment can be converted easily.
2. Plating time is shorter than for copper-nickel.
3. Adherence is good.
4. Resistance to corrosion in salt spray tests far exceeds minimum specifications for copper-nickel-chromium.

White brass plating is a technique dependent upon the skill and ingenuity of the operator. It was described in 1938 by plating experts of E. I. DuPont de Nemours and Co. Inc. Anodes of 80-20 zinc-copper were used in a solution of 8 oz. per gal. each of zinc cyanide, sodium cyanide, and sodium hydroxide, and 2 oz. per gal. of copper cyanide. Brighteners such as "Zinolite" and sodium molybdate were added. A current density of 20 amp. per sq. ft. was recommended; solution at room temperature with agitation and electrolytic purification.

Recent work has overcome early objections, and the brightness of the deposit has been improved by new addition agents, brighteners, and secondary additives. Higher copper ratios increase brittleness, and higher zinc lessens receptivity for subsequent chromium plate.

High purity metal is essential in casting the plating anodes (99·99 per cent) special high-grade zinc and electrolytic copper being used.

Little benefit is obtained from the plating of copper under white brass on steel, but on zinc die casts it tends to "seal" the surface tightly. Chemicals must be mixed carefully and continuous check made on the bath during production. The method of deposition of white brass from a still tank or rack plating should meet the following criteria:

1. A uniformly bright plate;
2. A good base upon which to plate chromium;
3. A combination which will withstand stoving (where a stoved lacquer is used), and
4. A plated part that gives adequate protection against corrosion.

In a pilot plant operation a deposit of 0·0003 in. of white brass was deposited in approximately 20 min. In appearance the white brass closely resembles chromium except for slight cloudiness. It has no "brass" colour or yellowish cast of chromium-nickel stainless steel. A deposit of 0·00001 in. of chromium was flashed over the white brass prior to exposure in a standard salt spray test.

After 24 hours no evidence of corrosion. After 36 hours, light white corrosion products appeared in the form of small specks which washed off with water. After 48 hours corrosion products were a little heavier but could be removed with a polishing compound. No tarnishing or loss of brightness was observable.

The importance of the chromium deposition should not be underestimated despite its microscopical thinness. The quality of the chromium determines to a high degree the worth of the total plate.

Production of a crack-free

chromium plate is considered possible on larger parts racked in still tanks. It may be that some solution additive such as aluminium sulphate, or a more precise control of solution analysis may be the answer.

Current densities as high as 100 amp. per sq. ft. have been used in still plating, but Mr. Knight considers it is practically impossible to know the area of work effectively exposed at any one instant to the plating solution. Line voltage is set at about 14 volts. On screws which used to be given the standard finish of 0·0003 in. copper, 0·0004 in. nickel and chromium flash, time in the salt spray test to the appearance of red rust averaged about 32 hours.

The same parts with white brass plus chromium have withstood up to 100 hours.

Chromic Acid Recovery

A portable chrome purifier has been introduced to reclaim chromic acid from anodising baths. Plating and rinse waters can be reclaimed and recirculated easily and economically, it is claimed, by this method. It eliminates the necessity of discarding chromic acid which is normally replaced with fresh acid to maintain a required *p*H and acid concentration. Contamination of the anodising solution is kept at a minimum, and with clean solutions voltage requirements are decreased, and an anodic film is produced having a resistance to the salt spray test of 1,000 hours on production samples. In plating, this chrome purifier permits recovery of contaminated chrome plating baths which must otherwise be discarded.

The portable models meet the requirements of the plant where several solutions have to be treated in different locations.

The manufacturers claim that this method will eliminate the necessity for waste disposal; save chrome which is in short supply; improve anodic films, and cut plating rejects to a minimum.

Assuming an average contamination rate in an anodising solution of 10 grm. per litre of aluminium oxide per month, the volume of anodising solution which can be handled by the various units operating on desired regenerant schedules vary from 2,700 gal. daily, making a figure of 450 gal. weekly to 14,500 gal. daily and 2,350 gal. weekly.

AUSTRALIAN SULPHURIC ACID PLANT

SIMON-CARVES (Australia) Pty. Ltd., an associated company of Simon-Carves Ltd. of Stockport, have received a contract to build a large Simon-Carves Monsanto Contact Sulphuric Acid Plant at Port Adelaide to produce sulphuric acid from pyrites, of which abundant local deposits exist. The primary purpose is to provide sulphuric acid for the production of large quantities of superphosphate fertilisers for South Australia. The plant will be operated by a new Adelaide company, Sulphuric Acid Ltd., on behalf of three superphosphate companies, namely Cresco Fertilisers Ltd. (by whom the contract was placed), the Adelaide Chemical and Fertiliser Co. Ltd., and Wallaroo-Mount Lyell Ltd. It will be possible to duplicate the plant, thus ensuring ample acid supplies for a future increased demand for superphosphate or for any type of chemical manufacture which may be started in Adelaide.

The plant will incorporate three Nichols Freeman flash roasters to produce sulphur dioxide gas from pyrites, and the gas will be treated in gas cleaning and cooling units. The acid-making plant will be a single unit with a capacity of 300 tons of sulphuric acid per day, and will be the largest single-unit sulphuric acid plant in the British Commonwealth.

The eventual value of the contract is expected to be about £A2,000,000. It will be carried out by Simon-Carves (Australia) Pty. Ltd., manufacture being undertaken partly in Britain and partly in Australia.

Mr. E. G. Pickering.—Mr. E. G. Pickering has been appointed joint managing director of Johnson Matthey and Co. Ltd., assayers to the Bank of England and refiners of precious metals. He will fill a vacancy on the board caused by the resignation of Mr. T. Girtin.

How to CONTROL THE FINISH *from the start!*

NO. 3 OF A SERIES

featuring some aspect of the John Hall DEMONSTRATION CENTRE. This shows a demonstrator guiding a freshly painted steel cabinet into the gas infra-red panel oven.

The J.H. Demonstration Centre has been described as the most unique service ever offered to users of industrial finishes . . . a service that comprises a free training course for paint operatives or foremen, and facilities for testing the finishing of all types of products under practical working conditions. The John Hall Demonstration Centre is open to inspection by all manufacturers who want to ensure complete *Control of the Finish* thoughout production. Please write at once on your letterheading for an illustrated brochure describing the service in detail.

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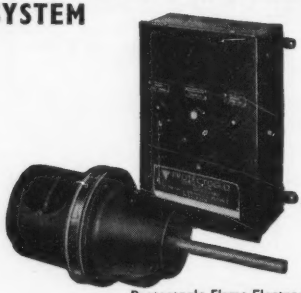

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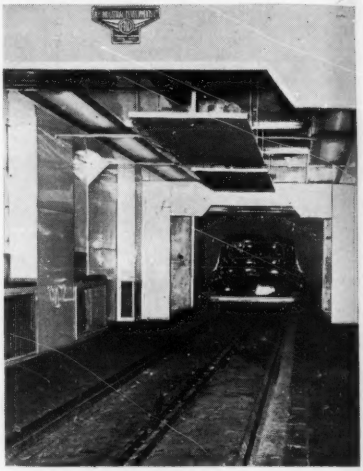
A.I.D. FOR INDUSTRY



No. 3—THE MOTOR INDUSTRY

Here is shown a typical tunnel type spray booth as designed and installed by A.I.D. Ltd. for one of the leading car manufacturers in the country . . . indicating the importance of A.I.D. equipment in the motor industry for ensuring a complete flow of perfectly finished motor vehicles to meet the ever-increasing export demands.

The economy and efficiency of spray painting falls right into line with the need of industry to effect increased production and saving of man hours, and the high quality finish attained with A.I.D. equipment in particular is appreciated on all sides.

Air Industrial Developments Ltd. cater for all trades. Whether your needs are large or small, do not hesitate to request the services of our technical organisation.

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THE MAN ON THE JOB

by **"SERVICE MAN"**

EXHAUSTING systems play their little part in contributing to finish defects; some of them also cause inconvenience in various ways. One trouble is the slow-moving fan set high in the wall. This will clear the air in time, of course, but it doesn't help the sprayer's breathing very much! Another objection to this slow clearance is that anyone wearing glasses is working in half-light most of the time. The paint always seems to be thickest on the inside of the lenses and with the present type of plastic framework, glasses are not easy to clean and keep in one piece! Three times in two months my glasses have parted company at the nose. The overspray dust, besides settling on glasses, also drops back on to the wet surface of the job and gives it that dry-sprayed look.

At the other extreme, the high-speed fan draws all the dust past the painted surface and the operator feels as though he is in the midst of a hurricane.

Unless one goes to terrific expense to provide a pressurised shop and all the gadgets that go with it, the perfect spray shop exists only in imagination. As the small man is in the majority it only remains for me to remind him that the shop should be kept clean and adequately ventilated.

Tack Rags

A big fault in finishing-shops is the use of rags. Lint from rags will float about all day and will eventually find some wet paint as a resting place. Anyone who has been using a rag near a shaft of sunlight must have seen this many times. Wiping the surface over with a rag moistened with thinners also leaves its quota of lint behind. The return of the tack-rag, long awaited in industrial finishes, should abolish the curse of lint. Tack-rags are not expensive if used intelligently and should be the only type of rag permitted in the actual finishing-shop. A finishing-shop sometimes means anything but a finishing-shop. All cleaning and pre-treatment operations should be carried out in another room. I suppose everyone appreciates this fact, but how many people do anything about it?

Impossible Conditions

Some years ago, at a conference on the finishing of domestic appliances, I described a glaring example of sprayers working under impossible conditions.

It so happened that the people concerned, a gas undertaking, wanted a refrigerator renovating for exhibition purposes. They had tried several times and failed to produce a decent finish and I was asked to go along and help them with the job. After a chat in their office, where it was mentioned by the way, that conditions in the spray-shop were not of the best, I was conducted to the "finishing" department. Inside the door I stood, frankly amazed, and this, briefly, is what I saw.

The centre of the floor was occupied with dirty, greasy cookers and fittings returned "off the town". To my right, along the west wall, was a bench at which several chaps were wire-brushing rusty burners, grid shelves, hot-plate sections, etc., ex. the "bosh". Along the north wall was the sandblast and the caustic pots. The east wall was made up of four spray booths; a large one for black cooker fittings; two for black cookers and another largish one for the coloured finishes. There was a passage-way from the door by which I had entered right past the colour booth continuing on to the assembly shop and stores. I saw a constant procession of men, with and without trucks of different sorts, going up and down this passage-way. The doors, by the way, marked "Keep Shut", were permanently open. This passage divided the rest of the shop from the box-ovens which were along the south wall; traffic had to stop when any of the oven doors were

open. Worse was yet to come.

Examining the ovens, which were very old, I noticed a twelve-inch pipe which seemed to enter the side of the first oven just above floor level and continue onwards through the second and third ovens in the same place; eventually the pipe went out of sight through the wall. Asking the reason for this I was told that it was the exhaust pipe from the main gas-engine, the heat from which kept the ovens at a temperature of about 160° F. Every stroke of the engine fairly shook the ovens and bits of rust and dirt fell from off the ceiling and walls inside. A test of the two temperature recorders—the door-mounted type—proved them to be faulty. One oven was without, and had been for a long time.

This, then, was the finishing-shop of a city's gas department, who could afford to equip the place in a fitting condition. I had a chat with the works manager who was of the opinion that if our company sent a report and suggestions to the Town Hall, something might come of it. We did this and in reply received a letter thanking us for our recommendations and saying that the matter would receive their attention in due course, etc. etc.

Four years later nothing had been done and I haven't been there since. The refrigerator? It was finished for them in our demonstration department.

This, of course, was an extraordinary case, but there are many, shall we say, modified examples of this sort of thing. I am afraid there always will be such cases too, whilst the finishing-shop is so often regarded as being the poor relation of the business.

Chemical Vapour Degreasing

Another enemy often encountered is oil and grease. Chemical vapour degreasing is not the perfect answer to this question. Like many other things it all depends on the article under process. As this system depends on condensation, thin-gauge metals take up the heat too quickly, therefore condensation ceases. An experienced man will use the boiling solvent in such cases. Others will ignore the instruction to this effect or may not know about it. Machined pieces collect swarf and dirt in crevices which are not brushed off before painting. Whilst the present system, properly applied, is near enough to perfection, there are always the operators who will take short cuts.

Many people use a caustic "bosh" as an all-purpose paint-stripper and degreaser. As a paint man I take a very dim view of these tanks; they can, and do, cause unlimited trouble. I refer, of course, to the open tank heated by steam, working at an unknown temperature and containing flake caustic of an unknown proportion. Jobs cleaned in this way, afterwards dipped in static water or hose-piped as a rinse, are still common everyday practice in spite of the drawbacks.

Wrong Usage

I was once called in to see a washing-machine that had been stove-enamelled white. The customer complained that instead of getting the blue-white he wanted, we had given him a pinkish-white. Furthermore, little pink spots had appeared here and there and an extra coat or two of the white had failed to obliterate the spots. The customer explained how the outer casing had been stripped off the machine and had been thoroughly cleaned off in the caustic tank, swilled off with hot water, and finally dried out in the oven.

Looking at the finish it was quite evident that red was bleeding through from the steel. Enquiries about the "bosh" revealed the fact that some red-painted castings had been in it a couple of days previously. I explained the evils of doing this and also tested the paint on a piece of scrap metal which came out of the oven the desired blue-white. We sealed off the bleeding with a couple of coats of aluminium and applied the finishing which turned out to be bluish—not pinkish. Noticing some greasy gearwheels near the "bosh" I pointed out the perils of pulling articles through a mineral oil film and we had a general chat regarding cleaning methods relative to the customer's needs.

The small man uses the "bosh" as a cheap, multi-purpose cleaning system; he probably cannot afford anything else. When handled properly it generally does the job. A little informative chat on what he may or may not do probably sticks in his mind. Reading articles on alkaline solutions, acid

rinses, etc., covers so wide a field that a lot of it is not relative to the job in question. Other methods being too costly, he experiments by trial and error methods until the "trouble-shooter" is called in.

Having sorted out trouble without involving the customer in extra expense always gives me great satisfaction. Service is our motto and it is the little man who requires it. I like dealing with these people. No formal approach or appointment in advance made via the office is required in the ordinary way. They are always the first to admit that the trouble is probably of their own making and usually make the "trouble-shooter" feel "at home", right away. I have made many friends in this way and still hope to make many more.

Continuing the subject of cleaning methods it always horrifies me to see newly sand-blasted articles mauled with bare, often greasy, hands. Gloves are generally provided but these get so dirty that it is doubtful if they are of much use. I have seen castings straight from the sand-blast piled up in a heap on a dirty floor and left there for hours, sometimes days, before painting. To get rid of this bottle-neck they are often dipped "as they come" and the tank gets an unwanted assortment of dirt, shot and grit.

The Trained Mind

There was an occasion some time ago when the difference between the untrained and the trained mind was brought home to me very forcibly

The story concerns a rather hefty exhibit for the Glasgow section of the Festival of Britain. A colleague and I visited a customer's premises to discuss the finishing of this exhibit—a component job. Some heavy castings were involved and these had been sent out to be shot-blasted. We were there when they were returned and we watched them being carefully lifted on to a bench. We inspected the castings from a distance of a yard or so, hands out of harm's way and hardly daring to breathe, when a loud roar of laughter brought us swiftly back to earth. The works manager, still laughing, explained that the sight of us viewing the castings from a respectful distance as though they were valuable and rare curios, was too much for him. Anyway, we escorted those castings to the paint-shop and didn't take a decent breath until they were safely coated with paint. We literally sat on this job until the exhibit was completed, and I imagine that those concerned were glad to see the last of us. As in gardening, thousands of potential enemies are waiting to attack your seeds and plants and it makes you marvel that they survive at all.

Wiping the job over with a rag dipped in thinners is a method in general use and, apart from the lint trouble, is fairly satisfactory. The dangers arise in using dirty rags and-or dirty spirit. There is the danger of such a rag spreading a little oil or grease a long way or swilling it into crevices. Dirty rags, used for cleaning guns or wiping knives which have been used on bleeding types of paint will spread trouble in a like manner. A spot of bleeding red can go a long way and is a constant source of annoyance to say the least.

Stoving Out Grease

There was at one time, and probably still is, an idea that grease could be stoved out in the oven. I have never seen it work with any degree of success and this practice is seldom carried out these days. However, its virtues were once explained to me at great length by an apparently successful user of this method. His theory was that the heat dried and killed the grease and opened the pores of the metal. If the paint was applied whilst the metal was still hot the pores would close as tight as a clam as the metal cooled, and there was your solid key-coat for the job. The little bubbles and blisters plus some small circular bare spots I asked about were explained away as air escaping from the pores and not affecting the issue in any way!

When confronted with such "facts" by a self-styled expert in these matters who also knew, so he informed me, all the answers, the only thing to do was to retire gracefully and leave the man happy in his ignorance. Oddly enough, I did not call on this man to receive a complaint; he just wanted me to check his oven temperature. He was very satisfied with the paint and informed me that he was using pool-paraffin as a

thinner instead of the blend we had originally supplied with the paint. This made the price per gallon, through the gun, so much cheaper. As long as he was satisfied with the poor job he was getting, I was not disposed to argue the matter. It is quite reasonable to assert that such people can get away with murder. In paint-finishing anything can happen.

MODERN CABINET MAKING, FURNITURE AND FITMENTS

THIS work, written primarily for craftsmen, students, draughtsmen and manufacturers, which has been out of print for eight years, has now been re-issued in a new edition and has been re-written and re-illustrated. It deals with all aspects of cabinet work having nearly 2,000 explanatory diagrams including both working and measured drawings, as well as photographs of contemporary work and historical examples, in shaping, veneering and the application of new processes of glueing, in addition to using plastic fittings.

Although production and construction aspects are covered admirably, nevertheless it is a pity that more information has not been included on wood finishing. There have been many developments in wood finishing, particularly since the war, and it looks as though there is room for an expanded chapter in this book covering the finishing side. It is up-to-date, including chapters on panelling and plywood as well as dealing with the specialised aspects of cabinet-making for exhibitions, show cases, church furniture and library fittings. However, since there has been a tendency to omit to mention finishing, that which the customer sees first should be considered at the design stage.

This omission of details on the finishing of furniture and cabinets is perhaps a grave one.

(Modern Cabinet Work, Furniture and Fitments. John Hooper. B. T. Batsford Ltd. 50s. net.)

On Saturday, 28th June, W. Canning and Co. Ltd., held their third post-war sports at their Lonsdale Road grounds. Amongst competitors and spectators were contingents from the firm's London and Sheffield Branches. Our photograph shows the installation and maintenance engineers' team pulling their weight!

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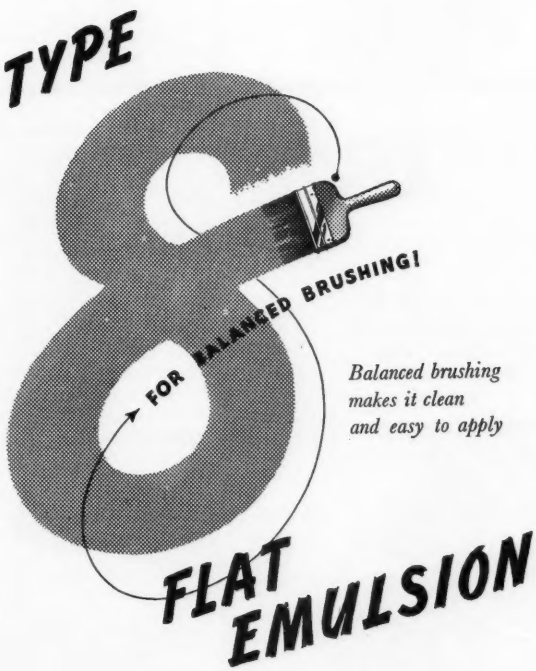

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(Continued from "Industrial Finishing," July, 1952)

RESEARCH ON ELECTRODEPOSITION

by

WILLIAM BLUM*

THE Bureau has co-operated since 1932 with the American Electroplaters' Society in exposure tests of plated coatings, which are still in progress. Specimens plated with coatings of carefully controlled thickness were exposed at industrial, marine, and suburban locations, and inspected at intervals. From the periods required for rust or other failures to appear, the relative protective values of typical coatings were determined.

From the results of these tests and of general experience, type specifications for plated coatings were prepared and were adopted by the American Electroplaters' Society and the American Society for Testing Materials. Similar requirements have been incorporated in Federal Specifications for plated coatings on articles purchased by the American Government.

Because the minimum thickness of plated coatings is one of the most important factors in their useful life, rapid and reliable methods for measuring the local thickness of coatings are desirable. Non-destructive methods are preferable because they permit the testing of a larger number of samples.

The Bureau therefore developed non-destructive magnetic methods for measuring the coating thickness, provided that either the coating or the basis metal is magnetic. These methods are employed in an instrument known as the Magne-gauge, which was designed at the Bureau but is manufactured commercially. Each Magne-gauge is calibrated at the Bureau before it is sold. Over 4,000 are now used for testing coatings on industrial, household, and military equipment. The principle has also been used in gauges for measuring the thickness of chromium inside gun barrels.

A further important requirement of a plated coating is good adherence; otherwise it may peel or blister and permit corrosion to occur. Methods for measuring the adhesion of coatings have required the preparation of special specimens. In the "nodule" method recently developed at the Bureau, however, a small mushroom-shaped nodule is plated adherently to

A microhardness tester for electrodeposited coatings at elevated temperatures employs a furnace of special design, a Vickers diamond indenter (specially mounted and operated to make a microscopic indentation on the hot specimen), and micrometer device (right) for orienting the specimen so that the indentation can be located more easily for measurement

* Chief, Electrodeposition Section, U.S. National Bureau of Standards.

the external surface of the coating whose adhesion is to be measured. The force necessary to detach the small area of coating under the nodule is then a measure of its adhesion. Although the method has not yet come into extensive use, it is a promising acceptance test for adhesion.

Still another property of coatings that may affect their usefulness is the stress that may develop in a coating during its deposition. If this stress is high, the coating is likely to crack in service. An instrument known as a spiral contractometer was devised at the Bureau to measure the stress during deposition. When metal is deposited on a spiral strip, any contractile stress causes movement of a needle that is geared to the lower free end of the spiral. From the extent of this movement, the stress (for example, in lb. per sq. in.) can be readily computed. Measurements with this instrument might well serve to show the presence of impurities that increase the stress, and thus permit better control of the baths.

One of the most critical properties of electrodeposits used to resist wear or abrasion, on printing plates for example, is hardness. Many measurements of the hardness of deposits of nickel and chromium have necessarily been made in the Bureau's researches. When the coatings are subjected in service to high temperatures, as in gun barrels and jet engines, their hardness at elevated temperatures, known as hot-hardness, is important. Methods and equipment for measuring the hot-hardness of metal coatings were therefore developed at the Bureau.

Electrodeposition from Non-aqueous Solutions

Inspection of the periodic system of the elements shows that about thirty-three metals, all in one rectangular block, can be electrodeposited from aqueous solutions. These include about fifteen metals that are electrodeposited commercially, such as copper, silver, gold, zinc, cadmium, indium, tin, lead, chromium, iron, cobalt, nickel, platinum, palladium, and rhodium.

Adjacent to these metals are those such as tungsten and molybdenum, which cannot be deposited in a pure state from aqueous solutions, but can

Gold-plating frames. These are made of bronze and plated with a thick gold coating to ensure protection against corrosion over a long period

be deposited as alloys with iron, nickel, or cobalt. Studies made at the Bureau have defined conditions for depositing alloys of tungsten that are hard and have certain industrial applications.

There is a present demand for pure coatings of such metals as molybdenum, tungsten, titanium, zirconium, beryllium, and aluminium. If these metals can be electrodeposited in a pure form with good physical properties, such coatings will undoubtedly find important industrial and military uses. An intensive research programme on this subject is in progress at the U.S. National Bureau of Standards. Because it is very improbable that deposition of these metals can be accomplished from aqueous solutions, even under conditions of very high temperature and pressure, an investigation of which was carried out in the Bureau's laboratories, studies are now being made on non-aqueous baths. These are of two types; those in which suitable metallic salts are dissolved in organic solvents to yield conducting solution; and fused salt baths, usually operated at relatively high temperatures.

As an example of the possibilities in this extensive and difficult research field, a report has just been published describing a new type of organic bath

for depositing aluminium. The bath consists of aluminium chloride dissolved in ordinary ether and contains also lithium or aluminium hydride. The presence of the hydride leads to production of dense, ductile deposits of aluminium, which will probably find use in plating other metals with aluminium and in electroforming wave guides for radio communication. It remains to be seen whether analogous baths may prove suitable for depositing other metals.

Typical of the fused salt bath is the cryolite bath containing dissolved aluminium oxide and universally employed for production of aluminium from bauxite. As the temperature of operation of this bath is above the melting point of aluminium, the latter is produced in a liquid form that is not suitable for coating metals or for electroforming of objects. The Bureau's search is devoted to baths that will yield solid metals, preferably in a dense form with a desired hardness and strength.

Research in progress on molybdenum deposition shows that fairly dense pure deposits of molybdenum may be obtained from a fused bath operated at 600° C. Further work is required to define the optimum bath composition and operating conditions.

Studies of this character on the rare or unusual metals usually involve the preparation and purification of new compounds of these metals and the selection of suitable organic solvents or fused salts. Hence a large amount of preparatory work is required, one result of which may be the discovery of previously unreported compounds. Work in progress here and elsewhere will undoubtedly lead to progress in this field, which has previously not been studied intensively.

Principles of Electrodeposition

The Bureau's studies and those conducted in other laboratories show that ultimate progress in the field of electrodeposition depends upon the acquisition of more knowledge regarding the mechanism of the process. This in turn must rest on a fuller knowledge of the atomic, molecular, and crystal structure of matter, and a better understanding of the constitution and behaviour of the concentrated solutions used in industrial electrolysis. It is manifestly impossible to include in a narrow field such as electrodeposition, studies on these basic aspects of science. An effort has been made, however, at the Bureau to develop methods for measuring and expressing the general phenomena of electrodeposition and to correlate existing knowledge on specific problems with basic science.

One of the most characteristic and important features of electrodeposition is the polarisation, that is, the change in potential, that occurs at the anode and cathode during electrolysis. This and the related over-voltage of hydrogen or oxygen have large effects upon the electrode efficiencies and the structure of the deposits. A simple method of measuring polarisation was developed in the Bureau's early work and has proved to be a useful tool in research.

Throwing Power

One of the practical problems in electrodeposition is the throwing power, which is an expression for the metal distribution on a cathode of irregular shape. A simple method was developed for measuring the throwing power under certain conventional assumptions, and this has found wide application in research on plating baths. In this connection the relations between throwing power and the primary current distribution, polarisation, resistivity, and cathode efficiency were demonstrated.

Extensive studies have been made on the primary current distribution, which is determined solely by the geometry of the system. Methods of computing the distribution on eccentric cyclinders, angles, planes, and other irregular surfaces were developed.

The actual electrode processes take place within a very thin film of solution adjacent to the electrodes. This film differs in composition from the body of the solution. Therefore, methods of studying the composition of cathode films were investigated. It was found that by conducting the deposition on the outside of a cylinder into which a low-temperature freezing mixture could be quickly introduced, the adjacent film was thereby instantaneously frozen. While keeping it

cold, successive layers of the frozen film were turned off on a lathe and were analysed. The results made it possible to plot the concentration gradients within a hundredth of an inch of the cathode surface.

Future Programme

Much more extensive studies are required to understand electrodeposition. These will be conducted as rapidly as the scientific programme of the Bureau permits. It is difficult to make plans for research long in advance, especially in the present unsettled state of world affairs. Even though, as now seems apparent, research in this and other fields is guided largely by present or prospective military needs, the latter involve such wide possibilities that research on all phases of electrodeposition is warranted. It is safe to say that the most promising field for study is non-aqueous solutions. Success in this field may well lead to or make possible important industrial and military developments. Special efforts will be made to concentrate work on this subject.

The same uncertainty is reflected in industrial electroplating. For example, the very great increase in the amount of nickel used in alloys for jet engines and other equipment has curtailed nickel plating on cars and other equipment. Substitutes now used, such as the plating of chromium over copper on steel, followed by a coating of clear lacquer, are not as satisfactory as the copper plus nickel plus chromium coatings normally used on steel. Any substitutes employing metals that are more available than nickel will be welcomed by the plating industry. Further studies on other metal and alloy coatings are therefore warranted, including their behaviour in the atmosphere and in service.

Military Needs

Experience in World War II has shown that even though plating for civilian use was sharply curtailed, the military needs required a total amount of electroplating that exceeded normal production. It therefore seems likely that uses of electroplating will increase and the demands for research in this field will continue to expand.

NEW BRITISH STANDARDS

THE following British Standards appear in the Monthly Information Sheet for June, 1952, and are available from The British Standards Institution, 24 Victoria Street, London, S.W.1.

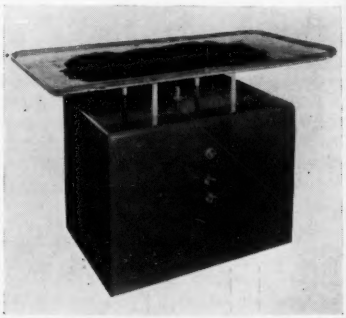
B.S. 1795:1952. Extenders for Paints.—This specifies requirements for asbestine, barytes Grades 1 and 2, blanc fixe, witherite, precipitated barium carbonate, whiting, china clay Grades 1 and 2, and kieselguhr. Clauses and methods of test cover composition, residue on sieve, oil absorption value, matter volatile at 98-102°C., matter soluble in water, colour and sampling. Special limits and tests for loss on ignition (for china clay), matter insoluble in hydrochloric acid (for precipitated barium carbonate and kieselguhr) and oxidizable sulphur compounds (for precipitated barium carbonate) are included. (Price 3s.)

B.S. 18711:1952. Minimum Requirements for Silvering for Glass Reflectors for Lighting Purposes.—This covers two types of reflector suitable for use in lighting fittings as follows:

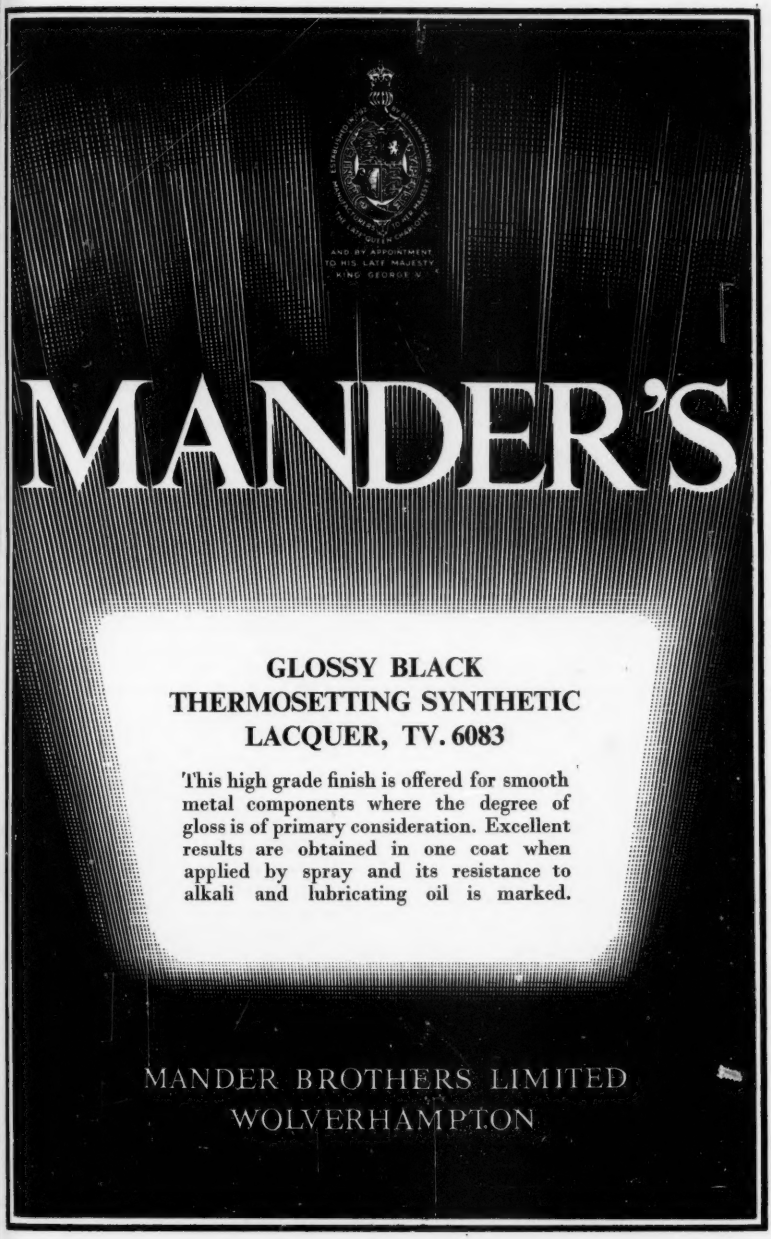
(a) Heavy duty, for exterior use, i.e., street and yard lighting, floodlighting, etc., and for abnormal or damp interior situations.

(b) General service, for use in dry, normal atmospheric conditions, i.e., commercial, industrial, domestic, etc., lighting.

It includes clauses on quality and materials, glass blanks, silvering, edge sealing, backing, temperature of backing and reflection factor. It also gives an appendix on the measurement of specular reflection factor. (Price 2s.)



In the July, 1952, issue of "Industrial Finishing" we gave details of 'Velvetronic" equipment by Spraytex (Manchester) Ltd., 168-172 Oxford Road, Manchester 13. This produces a finish equivalent to flock spraying, and the unit is pictured above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PART III

Reclamation of Vehicles

WHEN World War II ended, vast numbers of war-time vehicles were dumped in open storage pending a decision on the extent of their redundancy. Eventually it was decided that the vehicles should be reconditioned.

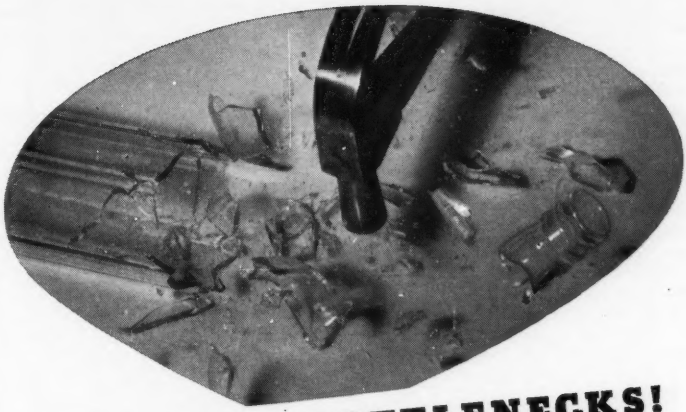
Large numbers of vehicles were delivered for reclamation in worn-out condition. Outdoor storage had rendered them heavy with rust, and to deal with them shops were reorganised into four groups, namely, dismantling, rust and paint removal, mechanical and body repairs, and painting and final assembly.

First, caustic solutions in small vats were used for paint removal, while wire brushes and scrapers were used for removal of rust, but output was limited to the amount of available labour, and costs were high, leading to a search for more efficient and progressive methods.

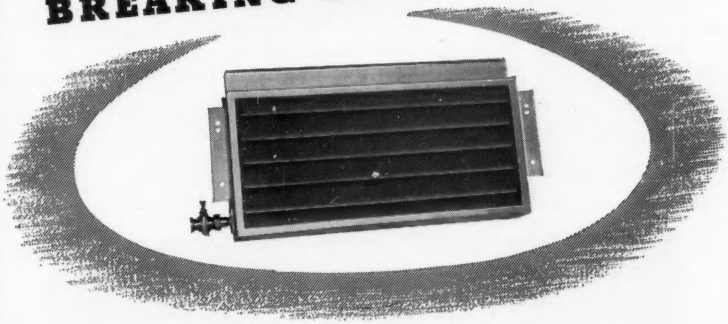
A range of chemical solutions was eventually tried out and it was found that at least one proprietary solution would remove rust on surfaces and in crevices previously inaccessible. Simultaneously rusting was inhibited and a satisfactory surface for paint-dipping in one operation was provided. A series of small tanks were installed and all hand and mechanical methods were eliminated.

Eventually larger tanks were installed to work in conjunction with the existing small tanks, so that a

Service vehicles before (right) and after (left) renovation



BREAKING BOTTLENECKS!



When components can be processed faster than they can be dried, output inevitably suffers. *That is why De La Rue Gas-Fired Process Panels are in such demand to-day*, for they are cutting drying times by as much as 90% on objects as diverse as curtaining and clocks in every one of Britain's major industries. Gas-fired for maximum reliability, economy and cleanliness—simple to instal and maintain, these panels can readily be installed in *your* production line to produce a fast, consistent yet flexible degree of drying that is not affected by atmospheric changes. De La Rue will be happy to give knowledgeable advice on all aspects of Product finishing . . . ask for our booklet 'Productivity Plus.'

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complete system was brought into operation which, by shift work, ensured non-stop output. Today, work on large reclamation contracts is carried out with increased speed for Army, Navy, Air Force and U.S.A.F. vehicles. Jeeps, lorries, armoured vehicles and all types of trailers, which have been either in storage or in service since the war, are being made serviceable again in accordance with specified programmes.

The first programme entails complete rebuilding. The second is devoted to renovating vehicles, armoured and otherwise. In both cases, vehicles in exceptionally rough condition are first stripped; then the chassis, cab and all components are put through the derusting process tanks in the following order:

1. Degreaser and paint stripper.
2. Water rinse by pressure sprays.
3. Scale remover.
4. Water rinse by pressure sprays.

The degreaser and paint stripper is used at the ratio of 1 lb. to the gallon of water at 90° C. The mild steel tanks containing this measure 24 ft. × 5 ft. 6 in. × 6 ft., and have a working capacity of approximately 3,000 gal. The efficiency of the solution is maintained by periodical topping-up. Grease and paint sludge which accumulates at the bottom of the tank is kept in check by complete tank clean-outs three times a year.

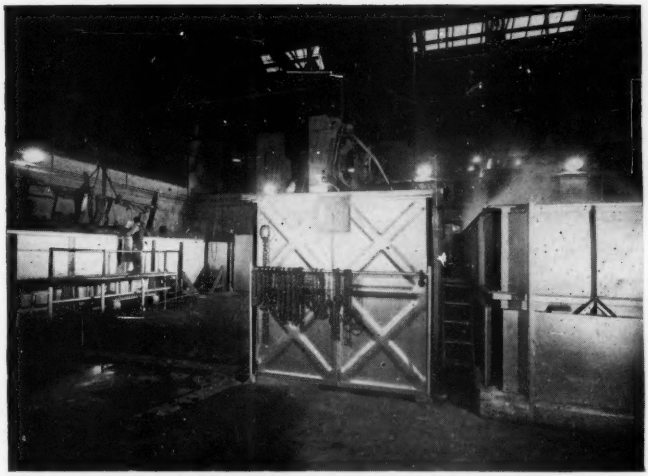
The period of immersion is variable, according to the type, quantity and condition of paint to be removed. As an indication, however, times vary from 20 min. upwards.

The scale-removing solution is used in varying proportions according to the density of scale to be removed. The usual proportion for heavy scale is two parts water to one of the descaler. This completely frees the components of scale in times varying from 5 to 20 minutes.

All components are now treated in another similar solution, the tank used here being larger than its degreasing companion, with a working capacity of approximately 5,000 gal. The concentrated solution is diluted to meet specific requirements and heated to 70° C. After 10-15 min. immersion it is free of rust, inhibited against further rust, and keyed for painting.

The number of components being treated in this way adds up to varying totals of from twenty to seventy complete vehicles a week (depending on the size of the contractors' plant and premises), as opposed to a fraction of that output by previous methods plus many times the labour.

The chassis, cab and all components are put through the derusting process



End view of three tanks used in reclamation. One is stainless steel and the other mild steel. Both are gas heated. The other is rubber lined and operated cold. All have 7,500 gal. capacity

From this department parts are conveyed to respective repair departments, namely, welding, body repair, petrol tank and radiator, and engine reconditioning. In each of these sections appropriate parts are inspected and repaired where necessary. On passing final inspection, all metal parts—except engines—are given final treatment in a rust remover and neutraliser.

Acknowledgment is made to Jenolite Ltd., 43 Piazza Chambers, Covent Garden, W.C.2, for the photographs illustrating this article.

WILD-BARFIELD ELECTRIC FURNACES LIMITED

FOR thirty-five years the Wild-Barfield Co.'s Research Laboratories have developed heat-treatment techniques. At this year's International Machine Tool Exhibition, attention was drawn to the latest developments of three important heat-treatment processes—gas carburising, carbo-nitriding and induction heating.

Gas carburising with town's gas has now become a precision process giving strict control of the type of case, great accuracy of case depth, shorter time of treatment, low cost, cleanliness and simplicity of operation.

The display traced the process from the entry of the gas into the gas preparation unit, where its deleterious constituents are removed to the gas carburising furnace. Microphotographs demonstrated the effects of such treatment and showed the control of the carbon gradient in the surface of the steel. Many applications of both gas carburising and carbo-nitriding were listed, the latter receiving a similar display treatment to that of the former.

Two working equipments were exhibited, one of the Wild-Barfield high frequency universal workhead and the other of a typical application of low or normal frequency induction heating.

Representing Styrene Co-Polymers.—Mr. Alan W. R. Thomas has joined the sales staff of Styrene Co-Polymers Ltd. Prior to 1939 Mr. Thomas was in the service of I.G. Dyestuffs Ltd., and since 1946, following war service, has been actively engaged in the industry with J. M. Steel and Co. Ltd. He will be representing Styrene Co-Polymers Ltd., in the northern areas.

DRAKE'S RELICS

At Berger House

HISTORICAL relics of Sir Francis Drake were shown recently in London by Lewis Berger and Sons Ltd., at Berger House, Berkeley Square, W.1.

It was felt appropriate at the beginning of the new Eiizabethan era that the opening of their new administrative headquarters, Berger House, in Berkeley Square, should be marked by a commemoration of the enterprise, both in commerce and exploration, that marked the era of the first Elizabeth.

Most of these relics accompanied Drake on his historic voyages. They have been handed down through the ages since 1596, and at present are in the keeping of a Devonshire family which can trace its ancestry back to Sir Francis' brother, Thomas, Sir Francis dying without issue.

Troubled Times

The relics have survived many vicissitudes, troubled times, civil wars and rebellions, and on 6th July, 1938, narrowly escaped destruction, when fire ravaged Buckland Abbey, Drake's home. On that morning the family and staff carried the drum, pictures and other priceless relics out of the blazing house to the shelter of a big cedar whose branches protected them from the pouring rain.

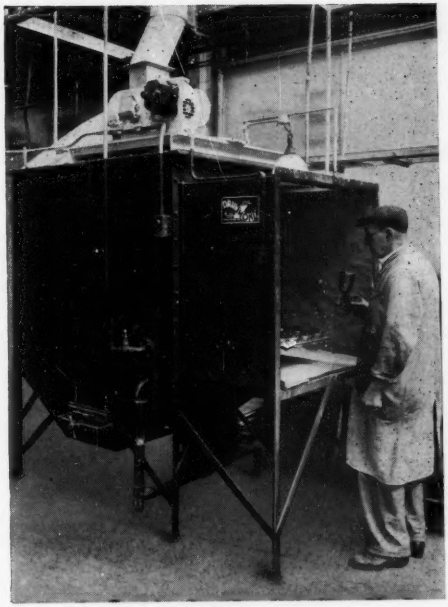
The collection, which is, of course, priceless and irreplaceable, is insured for approximately £60,000, and has to be closely guarded at all times.

The exhibition was officially opened on 8th July, 1952, by Admiral of the Fleet Lord Fraser of North Cape, G.C.B., K.B.E., and remained open until about the end of the month.

A brochure describing the relics has been written by Mr. A. L. Rowse, Fellow of All Souls College, Oxford, the eminent historian, who has specialised in the first Elizabethan era and the proceeds from the sale of this are to be presented to King George's Fund for Sailors.

Berger House, the new administrative headquarters of Lewis Berger and Sons Ltd. in Berkeley Square

WATER WASH SPRAY BOOTHS *of* GREATER SIMPLICITY *and* HIGHER EFFICIENCY



There are no pumps, nozzles or filters to choke or need attention. The only moving part is the fan, which handles the clean dry air from the high efficiency wash and discharges it to the atmosphere.

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WRITE FOR ILLUSTRATED LITERATURE

SPECIALISTS IN INTERMEDIATE METAL PROCESSING

The House of Berger is not quite Elizabethan but in 1759 the eighteen-years-old Lewis Berger discovered the secret of making a new and very beautiful Prussian blue, and that year he came to London from Frankfurt with his secret and lodged in a room in Drury Lane. His first six years in London were vainly spent in trying to interest the London paintmakers in his secret process and only in 1766, with the help of some friends, was he able to begin "Bergers" in the then "tiny village" of Homerton.

Showing the Flag

At a luncheon which followed the opening of the exhibition, "Bill" Darby, managing director of the Berger Group, introduced Mr. A. L. Rowse, Fellow of All Souls College, Oxford. Mr. Rowse had referred to the necessity of showing the flag of courage and confidence which had prevailed in the time of Sir Francis Drake. He condemned rumours of depression adding that today the British were still a great people in a great country. The first Elizabethans sold their brains abroad and today we must do likewise. The enterprise shown then was still a great necessity.

Mr. Darby referred to the industrial side of the Berger Group which was of growing emphasis. In the new factory at Chadfield Heath, styrene co-polymers would be made and something like a quarter of a million pounds had been spent on styrene co-polymer work and embraced a hundred odd patents giving worthwhile royalty earnings. He did not accept any tie-up between Sir Francis Drake and the Berger Group—except enterprise—for it was the first time that these relics had been shown outside Devonshire!

Beginning America

Mr. Rowse during his remarks referred to Queen Elizabeth's investment on Drake's voyages as showing a 1,400 per cent. return. On the question of whether or not Drake was a pirate he added that since Drake always sailed with the Queen's warrant he could not be so categorised. Philosophically Mr. Rowse took as his theme that "life is a struggle" —it was no good telling people that it was anything other than this and he abhorred the present tendency towards a "dull, grey world." He considered Drake as an armed merchantman whose primary object in life was to fight against Spanish monopolists in the New World, now, if you like, the New English-speaking World and in that respect Drake could claim to have been instrumental in beginning America!

INSTITUTE OF METAL FINISHING

OFFICERS AND COUNCIL

THE Council have appointed the following Officers for the forthcoming (28th) session, 1952-53:

President: H. Silman, B.Sc.(Lond.), F.R.I.C., A.M.I.Chem.E., F.I.M.

Immediate Past President: A. W. Wallbank, B.Sc., F.R.I.C.

Vice-Presidents: S. G. Clarke, D.Sc., Ph.D., A.R.I.C.; J. W. Cuthbertson, D.Sc., F.I.M., A.M.I.E.E.; R. C. Davies; G. E. Gardam, Ph.D., A.R.C.S., F.R.I.C., F.I.M.; F. Mason, M.I.E.E., M.Inst.M.; E. A. Ollard, A.R.C.S., F.R.I.C., F.I.M.; C. Wharrad; W. E. Wright, F.C.S.

Honorary Treasurer: F. L. James.

Honorary Secretary: S. Wernick, Ph.D., M.Sc., F.R.I.C., F.I.M.

Members of Council: As a result of the Ballot held recently, the following have been elected as Ordinary Members of Council: H. Cann; R. A. F. Hammond, B.Sc., A.R.C.S., F.R.I.C.; T. P. Hoar, M.A., Ph.D.(Cantab), B.Sc.(Lond.), F.R.I.C., F.I.M.; L. B. Hunt, M.Sc., Ph.D., A.R.C.S., F.R.I.C.; E. H. St. Clair Moorey, B.Sc.; J. W. Perring; J. M. Sprague, M.Sc., F.R.I.C.; N. A. Tope, A.I.M., A.M.I.P.E., A.C.T.(Birm.); I. T. Watkins.

Ex-Officio: The Chairman of each Branch of the Institute.

At elections held at recent meetings of Local Branches the following were appointed for the new session which commences on 1st September, 1952:

London:

Chairman: E. L. Masek. Hon. Secretary: W. E. Cattley, 13a Highlands Avenue, Acton, W.3.

Midlands:

Chairman: W. F. B. Baker, A.M.I.E.E. Hon. Secretary: C. R. Darby, 1 Calverley Road, King's Norton, Birmingham 30.

North-Western:

Chairman: P. A. Cartwright, A.M.G.I., L.I.M., M.I.E.I. Hon. Secretary: Mrs. E. M. Chiesman, 22 Manley Road, Whalley Range, Manchester 16.

I.C.I.—Change of Address. The Central Publicity Department of I.C.I. moved to a new address on 23rd June, 1952, nearby Lambeth Bridge, at Thames House, Millbank, London, S.W.1. Telephone: VICtoria 4486. Written communications should be addressed as follows: Imperial Chemical House, Millbank, London, S.W.1.

ELECTROTINNING THE AWKWARD JOB*

THIS is the story of the adaptation of the old established art of "contact tin plating" to the solution of modern engineering problems. It began as an improvisation to speed up the production of aircraft engines during the most critical phase of the recent war, and it has matured into a new technique of extraordinary flexibility applicable alike to the tinning of the bores of fine tubes, and the interiors of most complicated apparatus. Large food or beverage handling equipment can now, if necessary, be re-tinned *in situ*.

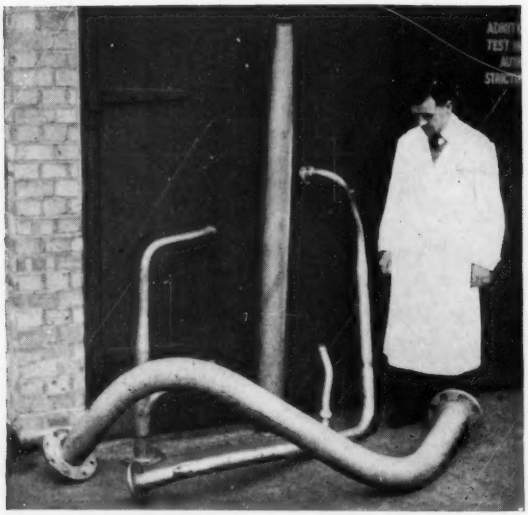
The coating of one metal with another by immersion in a suitable solution, sometimes called "displacement plating," has been practised for over 100 years. A modification of that art referred to as "contact plating" is little less ancient. In contact plating a metal which by itself could not initiate the plating process is immersed in contact with some more active metal, such as aluminium, and therefore becomes plated.

The new development[1] comprises two processes. One is the use of aluminium for contact tinning to produce relatively thick deposits without the use of an external applied current, the other is the use of aluminium contacts during stannate tin-plating to boost deposition on awkwardly placed areas where otherwise the coating would be unduly thin.

Awkward Jobs

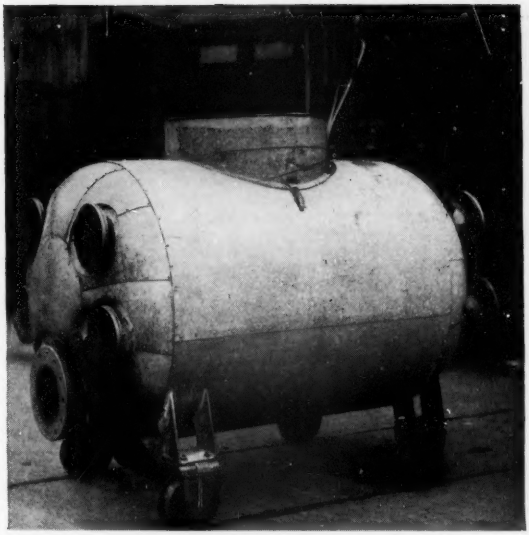
During World War II, it was found necessary to tin the inside of a copper centrifuge shaped somewhat like a horseshoe but the problem of designing a suitable internal anode seemed insoluble. After some experiments it was found possible to get a satisfactory internal coating from the standard sodium stannate plating bath by attaching pieces of aluminium strip to the copper shell at suitable points. The rate of deposition claimed was about 0·0002 in. per hour and the process of deposition continued after the initial complete covering had been achieved. In fact the centrifuge in question withstood two years intermittent flying service with varying coolants and suffered little deterioration.

*With acknowledgment to "Tin and its Uses" No. 26, *May*, 1952.



Examples of large pipes tinned internally by the use of a plait of aluminium wire in lieu of internal anodes

(*Courtesy, D. Napier and Sons Ltd.*)



A large vessel with complicated branches tinned internally by using suitable aluminium contact strips

(Courtesy, D. Napier and Sons Ltd.)

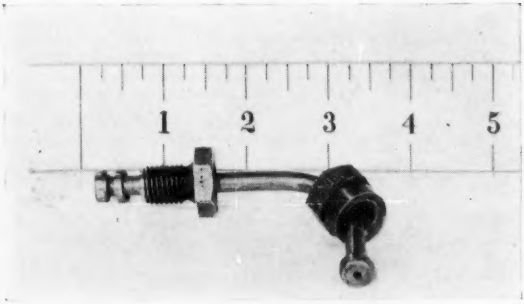
Further experiments established that if suitable light alloy contacts were employed during normal plating operations special internal anodes were unnecessary. As cases in point, a steel tube 8 in. long with a 1/16 in. dia. hole was tinned inside and out in 20 min. with only a thin wire of light alloy placed in the bore; a tank 6 ft. long and 4 ft. dia. with several flanged inlets and outlets was successfully tinned by this dual process after efforts to electro-tin with internal anodes had left several bare patches in the inlet branches. Pipes 18 ft. long have been tinned by using a plait of wire as a contact. The pipes with their side branches were sealed to leave one end open. The wire was inserted and the pipes filled with hot solution from the tinplate bath and left overnight. Pipes so tinned have been in service circulating hot water or hot oil for nearly two years and are still completely coated.

This type of tinplating has also been used successfully on high duty engine components to eliminate fretting corrosion, a coating thickness of 0·0005 in. to 0·001 in. being found best.

Tin coatings produced by the contact process are said to be more dense than those produced by normal plating and the bond is so good that the process has been used for the tinning of bearing shells prior to casting on white metal.

How the process works

The function of the aluminium contact is, of course, sacrificial. In the sodium stannate solution the aluminium is anodic and dissolves, releasing an equivalent amount of tin. The special



This pipe has a 2 m.m. bore and was tinned internally by threading a fine aluminium wire through the bore. The size of the wire is chosen so that when it is dissolved the desired coating thickness has been put on

(Courtesy, D. Napier and Sons Ltd.)

feature of the process, however, is that the area of the aluminium must be small compared with the area to be plated (about one-fortieth is recommended). This gives rise to a relatively high current density on the aluminium and much of the tin deposited on its surface does not adhere and in consequence the plating continues steadily though slowly until the desired thickness of tin has been deposited. The sodium aluminate formed in the bath hydrolyzes and an aluminium compound is precipitated on to the bottom of the bath together with some tin. In consequence the valuable plating solution is not contaminated and no tin is wasted. The considerable amount of tin deposited loosely on the aluminium can also be recovered.[2]

The concentration of sodium stannate can with advantage be reduced if the process is operated as simple displacement tinning without the use of an external plating current, an optimum concentration being around 50 grams per litre.

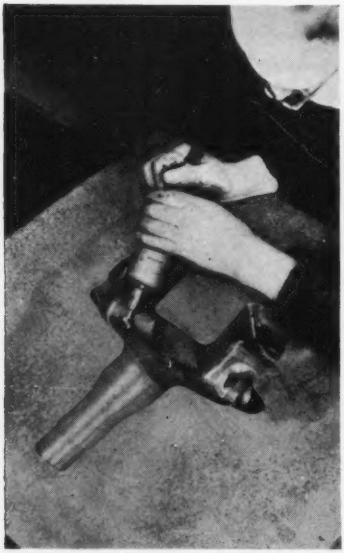
Where an external current is used the standard sodium stannate bath recommended by the T.R.I. is satisfactory.

REFERENCES

[1] Contact Tin Plating-Electroplating, Sept., 1951. J. K. Wilson and O. Wright.
[2] Immersion Tinning of Steel by Internal Electrolysis, O. Wright and H. D. C. Rapson, a paper to the Electro-depositors' Technical Society (not yet published).

PNEUMATIC TUNGSTEN CARBIDE CUTTERS

A NEW series of air-operated tools have been developed by the Atlas Diesel Co. Ltd., Beresford Avenue, Wembley, Middlesex, which are claimed to cut the cost of finishing tool-steel dies, and similar work formerly carried out by hand chipping, and grinding with mounted emery points. These are pneumatic rotary filing machines used in conjunction with tungsten carbide cutters.



One of the new series of air-operated tools by Atlas Diesel Co. Ltd.

These cutters have been developed in recent years and have opened up a new field in the finishing of high alloy steel and other hard materials on which only grinding wheels and grinding pencils could previously be used.

To obtain optimum results and to avoid wear and chipping or breakage of the teeth it is essential that the cutters are operated at the correct speed and that they are rigidly mounted to run perfectly true and without vibration in the chuck or slackness in the bearings of the tool. It is also vital that the power of the tool used is correct—neither too little nor so powerful as to overload the cutter.

The high speed necessary to exploit the advantages of the tungsten carbide cutters and to give a good finish is a characteristic of the new equipment.

These tools, which are small, light and well balanced and therefore easy to handle without fatigue, are available in a range of speeds varying from 50,000 r.p.m. down to 650 r.p.m.

An interesting feature is that the exhaust air is led forward around the chuck thus serving both to cool the front bearing of the tool and also to clear the cuttings from the work, as will be seen in the illustration.

"More Efficient Plating."—Brochure B.1365 describes the "inner-cooled" plating rectifier manufactured by the Electric Construction Co. Ltd., Wolverhampton. It gives sectional diagrams together with physical and performance characteristics of the plating rectifiers manufactured by the company.

CRACKING IN VITREOUS ENAMEL

UNDOUBTEDLY this familiar defect is appreciated both by the vitreous enameller and his customer, but there are many cracks which cannot be seen by the eye. Some time ago a study of these small cracks was made by the electrified particle expansion method in which a special form of calcium carbonate was blown through a composition tubing, and in passing rubbed off electrons on to the tube, thus emitting powder which was electrostatically charged positively.

When such positively charged powder makes contact with vitreous enamel on a metal base, the electrons in both the enamel and the base tend to become attracted. However, the metal, being a conductor, allows its electrons to flow in the direction of the positively charged carbonate on the enamel surface. Thus, if the enamel is cracked, the carbonate positively charged particles are attracted to this point and show themselves by a build-up of powder which can be seen.

In vitreous enamelling, if cracks are present, they tend to discolour, and to detect them it is quite common to rub carbon black, or oil, or ink on to the surface, and if no cracks are found by this method it is assumed that none are present. There is, however, always the possibility that those cracks, not detected by this latter method, will open during transport, leading to discolouration.

Theoretical Considerations

In the *American Ceramic Society Bulletin*, February, 1952, pp. 33-38, there appears a paper by Henry N. Staats of the Magnaflux Corporation, Chicago, Ill., in which he deals with the theoretical considerations in the cracking of vitreous enamel, which concludes with the following summary:

"It would appear, from experimental work and experience gained with the use of Statiflux* in the field during the past four years, that the occurrence of cracking in glass and enamels is not a simple subject. Undoubtedly, there are many other factors, not mentioned in this paper, which influence the occurrence and severity of cracking. However, on the basis of this work alone we can surmise that cracks formed in enamels generally occur because of tension stresses on the surface of the enamel and thus weaken it to a future lower tension stress. In addition to this we have found that the same crack formed in tension weakens or sensitises the cracked area to a comparatively mild compression stress which ordinarily might have been ignored had the tension crack not been present.

"One important point to remember is that in many instances it seems necessary that a stress opposite to the original cracking stress must be applied in order to cause failure or removal of enamel. This may explain why shake and impact tests do not always correlate with field failures. In other words, if a packaged enamelled object receives a crack somewhere on the assembly line, the stresses placed on the object during the proof testing may not be in such a direction as to induce failure. In fact, there is a good possibility, ironically enough, that the very act of shaking, or impacting may *induce* cracks which can increase the likelihood of field failure, particularly when the tested specimen is subjected to compression stresses.

"Summing up, on the basis of the evidence presented in this report, cracks in enamel seem to follow certain general rules. These are:

* Statiflux, trade name of the Magnaflux Corp., applied to materials and equipment for use with Electrified Particle Inspection Methods. These methods are described by U.S. Letters Patent No. 2,499,466, and other patent applications now pending.

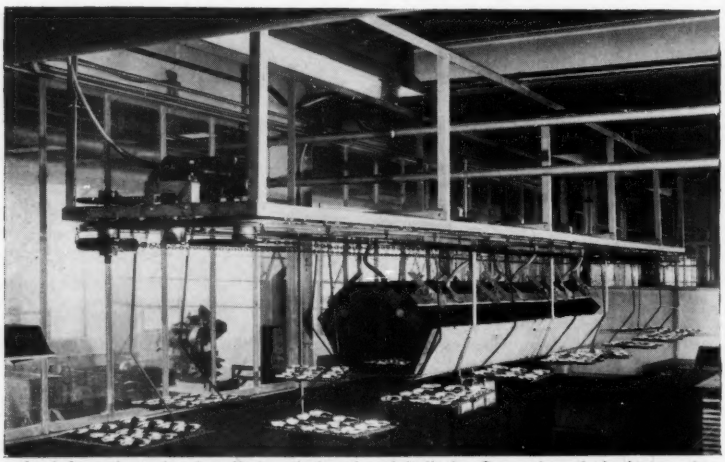
1. Cracks in glass or enamels can exist too small to receive a discolorant or be detected by the human eye.
2. Cracks are detectable down to less than a tenth of a micron in width by the use of Electrified Particle Inspection Methods.
3. Cracks always occur at right angles to the direction of an applied stress.
4. Tension cracks weaken enamels to a secondary, lesser applied tension stress.
5. Tension cracks appear to sensitise enamels to subsequently applied compression stress.
6. The wedging action of included dirt, hydrated crystal growth, or mismatched glass particles in a crack may account for the apparent sensitisation of a tension crack to a subsequent compression stress.

"It should be stated that the Electrified Particle Inspection Method is an extremely sensitive engineering and inspection tool which can, and has, played an interesting and valuable role in the field of non-destructive testing.

Like any other non-destructive test, its use must be justified in terms of the need for such a test and value received.

"The only complaint ever levelled at the method has been the fact that it has been too sensitive for the purpose of locating cracks in many ceramic products. A microscope is used to obtain information out of view of the human eye. The electrified particle inspection method also is used to obtain information out of view of the human eye. With either instrument, the observer always reserves the right to reject or accept his findings. It would seem that in the quest for truth a more serious complaint against any such test or instrument would be the fact it was not sensitive enough.

"There is no known non-destructive test method which can solve a problem directly. Methods of this kind are inert things. They cannot think; this must be done by man. Statiflux must be used with the understanding that it is one more tool in the engineer's bag of tricks, not as a revealer of deep, dark sins of the enameller."



An infra-red stoving installation designed and built by Casemakers Ltd., for use in one of the factories of the Dennison Group for drying synthetic lacquer on fabricated components. The installation, with a loading of 22 kW, dries the components in 4 min. at a rate of 500 per hr. Energy is provided by six new Metrovick electric infra-red projectors fitted with tubular sheathed elements which operate at red heat. As will be seen from the illustrations the construction of this particular plant is extremely simple; the projectors and conveyors are suspended from the ceiling leaving the entire floor area clear for the passage of trolleys, etc.

ANTI-CORROSIVE PRODUCTS

THE materials Serviron and Dampcoat were recently examined by Treharne and Davies Ltd., chemical consultants and analysts of Powell Duffryn House, Cardiff. The following are extracts from their report:

Serviron

This product as received is a black substance somewhat thicker than oil in consistency. It soils the hands but the stains are removable by soap and water. No irritant effects were experienced in so doing. Reference to the certificate of test will show that the product affords protection to metallic surfaces against various corrosive chemicals including dilute acids, alkalis and brines, whereas exposure to concentrated acids appears to cause Serviron film to peel off and to disintegrate.

The product appears to inhibit the growth of fungi and to arrest oxidisation, rust and electrolytic effects. No doubt due to its complete non-drying effect applied films experience no surface cracking, rippling, or distortion and for the same reason Serviron cannot be compared with ordinary paint in this respect. An applied film of Serviron imparts no taste and no discoloration to water and the quality of cold drinking water is not impaired in any manner when confined in tanks which are surface-wet with Serviron. Steam and highly humid atmospheres appear to penetrate the Serviron film to a very slight extent only.

As a conclusion to our comments upon Serviron we feel that it could be more aptly described as providing a permanently liquid film of high surface adherence, rather than a permanently plastic coating, for the latter expression suggests a non-wetting and flexible coating as with rubber finish. After all Serviron remains a permanent liquid, although viscous, irrespective of its film thickness and length of application.

Dampcoat

Dampcoat is a black viscous liquid having without exception all the properties, features and characteristics which have been reported for Serviron. It is not readily appreciated why the two products exist separately, with the outstanding exception that Dampcoat can definitely be applied efficiently to a wet-wet surface. No doubt this justifies its separate existence.

Perhaps it is an achievement that it possesses the same properties of resistance to corrosives, such as dilute acids, alkalis and brines as Serviron and yet possesses the extra ability of being capable of application to a wet surface.

Applications

The object in using these materials is obviously where metallic corrosion must be avoided, although since the surface remains tacky and as the material contains graphite it is not suitable for those components which must be handled.

Typical examples of their use are as follows:

The drinking water tanks in the Savoy Hotel, London, are coated on the inside with the material. The Shaw, Savill and Albion Line have used these materials for coating their distilled water tanks and double bottoms. Large quantities of this material are used now by shipbuilding firms in the North of England for coating the inside of deep tanks, ballast tanks, fore and aft peak tanks, etc. etc. The British Broadcasting Corporation use it to protect their air conditioning plants as well as for their fan plates. Hardman and Holden use it as a gas holder protective where severe acid corrosive atmospheric conditions exist. It is used by Government departments for the protection of sliding surfaces operating under water particularly where a lubricant is also necessary.

The material is of American origin and certain experiences of American firms are worth while noting.

At the Ford Rouge Plant, Michigan, conveyor protection was considered of vital importance and one conveyor under test was equipped with an automatic lubricator. This was found unnecessary and after one application of Serviron the conveyor continued in steady operation for 26 weeks before the second application was necessary. Later experience tended to show that the interval between lubrication could be extended to 1 year.

From the Chrysler Motor Corporation came information on one of the bonderizing conveyors used at the Dodge main plant. Here two men were solely employed for the purpose of applying lubrication continuously to the conveyor

equipment. Yet, even so there was a trolly wheel loss of 5 per cent. per month acting adversely upon productive output. By using Serviron the two men have been eliminated for lubrication and one application of the material has so far been satisfactory over a 3-month period.

At one of the American Briggs Motor Body Corporation's plants, continuous lubrication became unnecessary and Serviron was used at weekly periods.

The Michigan Chrome and Chemical Co. had the problem of lubricating a conveyor in contact with chromium-plating vapours. Normally lubrication was necessary every 2 weeks but was extended to 1 year by the use of Serviron.

The difference between the two materials is that Dampcoat can be applied to damp metal surfaces and even to surfaces of metals which are completely submerged in water.

It is important to know that the material remains as a soft and viscous film indefinitely and both may be applied by rubbing on, brushing or spraying at about 120° F. when the material becomes sufficiently fluid.

Recently some preliminary tests have been completed which show that it may be used as an undercoating for the subsequent application of cellulose on wood, metals and aluminium.

As however, many of these problems depend upon the circumstances the company marketing these products, XZIT (G.B.) Ltd., 175 Piccadilly, W.1 (Telephone: Regent 1875/6) is prepared to carry out tests on specific samples before making a firm recommendation.

STOVING PAINT ON INSTRUMENT DIALS

THE finishing of metal discs for instrument dials at the works of the Metal Gravure Co. Ltd., has been speeded by the installation of a small, compact, infra-red paint-stoving plant, designed and manufactured by the General Electric Co. Ltd.

The painted discs, in a variety of shapes and sizes, are carried on trays from the paint spraying shop by a chain con-

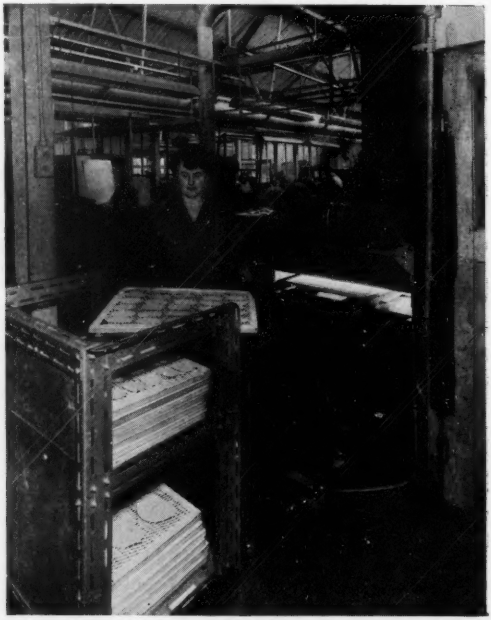


Fig. 1. Trays of finished dials being removed from the plant

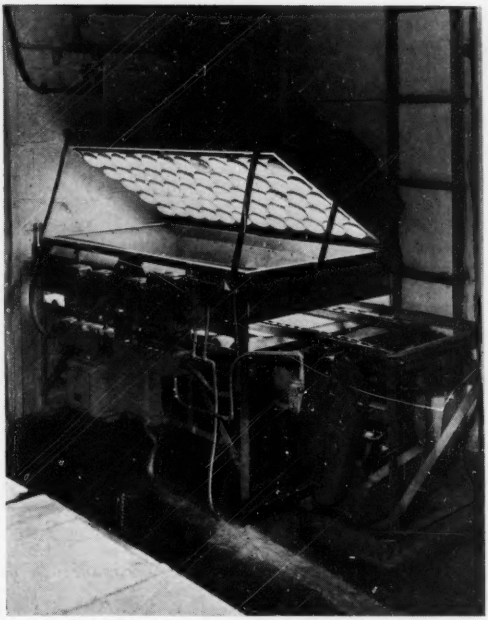


Fig. 2. General view of the plant showing the hinged portion swung upwards for maintenance of the lamps, etc.

veyor which passes through an opening in one of the walls to the heating plant installed on the other side. Here the paint is stoved by the radiation from a horizontal bank of Osram infra-red reflector lamps mounted in reflectors of a special aluminium alloy.

Sixty lamps, arranged in twelve rows, are employed in the plant, which is only 6 ft. long and 2 ft. 6 in. wide. Variations in heat intensity are obtained by the independent switching of groups of two rows of lamps. An interlock prevents the switching-on of the plant before the fume extraction gear in the spraying shop is put into operation.

The bank of lamps is hinged to the main framework to allow easy access to the lamps for cleaning and maintenance. The heating chamber is enclosed as much as possible with reflecting surfaces to prevent loss of heat due to stray radiation and to minimise the cooling effect of air currents.

"Teamwork."—House organs are a tremendous problem for the editor—arousing interest, getting contributors and presenting what is often the mundane in an attractive manner. Certainly the editor of "Teamwork," the house organ of British Paints Ltd., seems to have surmounted this difficulty. The June issue includes news snippets such as one of the staff escaping a runaway bus, news from the overseas interests of British Paints, another news item in which the S.S. Flying Enterprise and the tug Turmoil, not so long ago front page news, use British Paints' products. A most amusing and interesting effort even to those not members of the organisation.

Testing Equipment.—Research Equipment (London) Ltd., have just issued a folder illustrating various items of testing equipment which they manufacture for the paint and allied trades, amongst which are humidity cabinets, salt spray cabinets, hardness rockers, fineness of grind gauges, and film applicators. They will shortly be opening a small showroom at their offices, 64 Wellington Road, Hampton Hill, Middlesex, where a selection of research equipment can be viewed.

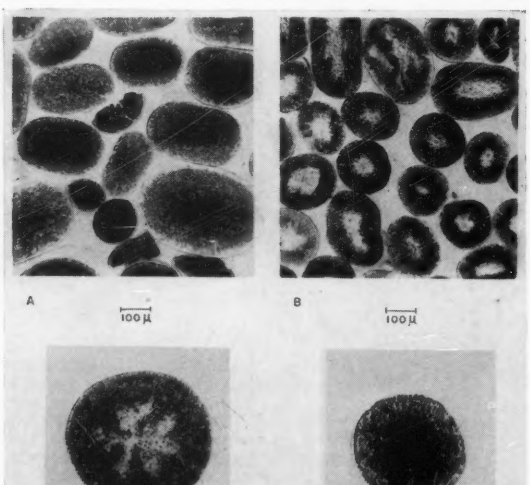
PAINT BRUSHES

–Distinguishing Fibres

A rapid, reliable procedure for differentiating between hog bristle and other animal fibres, such as horsehair, has recently been devised by Dr. S. B. Newman of the U.S. National Bureau of Standards. The Bureau's procedure, which is based on the difference in the distribution of pigment in the fibre cross sections, provides a more adequate basis for *judging paint brushes* and other bristle products than the rule-of-thumb methods that are commonly used in the trade.

In determining the fibre content of brushes and samples of bristle, the so-called "eye and feel" tests, based on the tester's previous experience in handling and dealing with the fibres, are most often employed. As the typical bristle is a flagged, tapered fibre, while horsehair is neither flagged nor tapered, it is not too difficult to distinguish a large percentage of the bristles from horsehair in this way. However, in every sample of bristle, particularly in the finer grades, there are many fibres which lack flags and in which the taper is negligible. For this reason, a more objective method has been needed for definite differentiation between these two fibres.

The use of differences in pigment distribution to differentiate between bristle and horsehair had previously been suggested. However, this method appeared to have several possible drawbacks, such as the difficulty of preparing microscopic specimens and the possibility of variations in pigmentation at different levels in the fibre, in different types of hair from the same animal, and in animals



Differences in fibre cross section form the basis of the procedure devised by the U.S. National Bureau of Standards for differentiating between bristle and horsehair. The pigment in hog bristle (A, D) is more dense at the centre of the cross section, whereas in horsehair (B, C) the pigment is concentrated toward the periphery

from different geographical locations. The Bureau therefore began an extensive microscopic study of bristle and horsehair. Samples were collected from a wide variety of commercial, from living animals, and from museum specimens representing a broad geographical distribution.

Samples of brushes containing 200 or more fibres were sectioned without difficulty by means of a conventional microtome. Individual fibres were embedded in methacrylate polymer before sectioning, using the latest microsectioning process developed by the Bureau. The sections were mounted and the pigment distribution studied. It was found that in general the pigment in hog bristle is more dense at the centre of the cross section and becomes more dilute at the periphery, whereas in horsehair the pigment is concentrated toward the periphery and exhibits little or no natural colour in the central portion. These basic differences were found in all fibres regardless of the geographical origin of the animal, the particular hair type, or the part of the animal body from which the hair was obtained. Differences in the medullation of the two fibres also aid in their analysis. Many of the bristles are hollow, while the horse fibres possess a cellular medulla.

Further studies showed that the pigmentation pattern of the fibre is a characteristic of the particular taxonomic family to which the animal belongs. Thus, other species of the horse family (Equidæ) were found to exhibit the same pigmentation pattern as the domestic horse, while other species of the pig family (Suidæ) resembled the domestic pig in fibre pigmentation. On the other hand, when hair from the peccary, a member of a family (Tayassuidæ) closely related to the pig family was tested, it was found to have a completely different type of cross section.

Artificially flagged horsehair is often found in bristle brushes. Synthetic flags, as would be expected, were found on fibres with little or no taper. The flagging occurred practically at one point on the length of the fibre, and many branches, often a dozen or more, were found in the flag. At the point where the flag begins to form,

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the hair seemed to increase in diameter. Natural flags contained fewer branches and these divided at different levels from the main trunk.

From the present studies, it was concluded that differences in pigmentation pattern may be used to differentiate between horsehair and bristle of all types except those that are naturally white or bleached. As the quantity of unpigmented fibre used in commercial paint brushes and other brushes is relatively small, the pigmentation method provides a firm basis for differentiation between bristle and horsehair in commercial products.

TINPLATE DEMAND

AS is generally known, the hot dipping process produces the heavier coated grades, namely, 20 oz. per basis box—1 oz. per basis box being equivalent to 0·000004 in. of tin. The electrolytic process gives 4 oz. to 8 oz. per basis box. These between them cover 90 per cent. of world production but there is the 12 oz. electrolytic grade used for milk packing and certain closures. Figure I shows how the world production and demand for electrolytic and hot dip tin has been proceeding—on the packaging side the major outlets are lard, meat, fish, dairy products, fruits and vegetables as well as beer, oil and a considerable trade in pet foods. In 1952 the United States was using 62·3 per cent. of electrolytic tin and 37·6 per cent. of hot dip. A modern electrolytic line has an annual capacity of 75,000 tons per year which is large in comparison to the total annual consumption of tinplate in many countries.

Chez Nous.—The Summer Issue of "Chez Nous," the house magazine of Pinchin, Johnson and Associates Ltd., includes some interesting and topical articles ranging from dogs and paint manufacture to the celebrated play, "While Parents Sleep," performed recently by the Dockers' Dramatic Circle. It includes also the results of the journal's International Photographic Exhibition, and is packed with "P.J." personality notes.

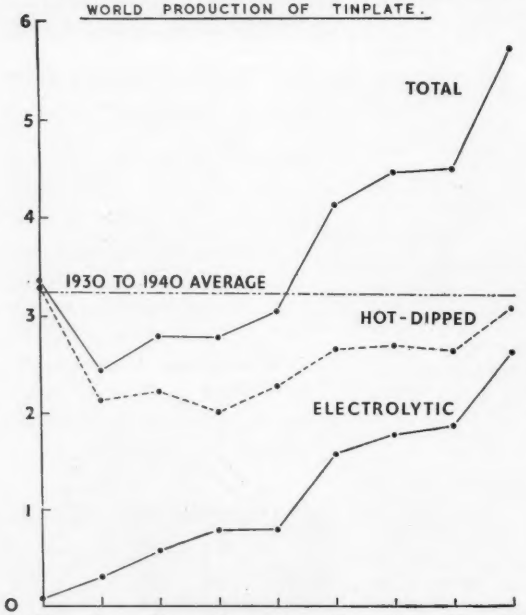
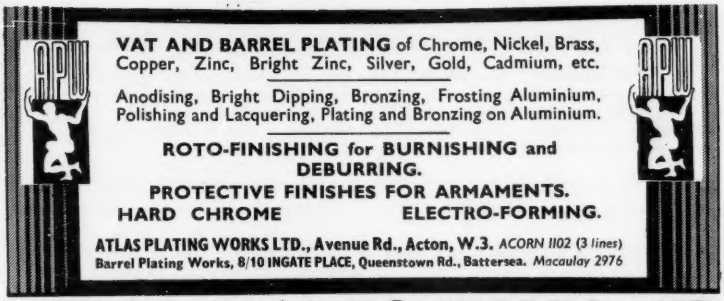


Fig. 1. The development of electro-tinplate has contributed to a remarkable upsurge in world tinplate consumption, and the consumption of hot-dipped plates has also risen steadily during the past five years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MEDALS AND AWARDS

THE Council of the Institute of Metal Finishing has approved the establishment of the following Medals and Awards. These have been made possible through the generosity and co-operation of three of the Corporate Members of the Institute.

Hothersall Memorial Medal and Lecture.—The Mond Nickel Co. Ltd., have very kindly endowed the annual award of a palladium medal (with which will be associated a sum of £50) for an initial period of seven years. The award will be presented to a person of eminence selected by the Council of the Institute who will be invited to deliver a lecture in memory of the late Mr. A. W. Hothersall to be known as the Hothersall Memorial Lecture.

Johnson Matthey Silver Medal.—Through the generosity of Johnson Matthey and Co. Ltd., a Silver Medal will be awarded annually, or at such times as may be decided by the Council, for the best paper presented to the Institute on the deposition of precious metals.

Westinghouse Brake and Signal Co. Ltd. Prize.—Finally, the Westinghouse Brake and Signal Co. Ltd. have generously endowed an award for the best publication appearing in the Journal of the Institute which, in the opinion of the Publications Committee, shows the most valuable advance in the science or practice of electrochemistry in general and electrodeposition in particular. The Award will amount to £25 annually and will consist largely of a selection of books. There is no restriction respecting subject matter within the limits mentioned above; neither is there any restriction respecting age or nationality of candidates for the Award. The Award is to be endowed for a period of seven years in the first place and is then to be subject to renewal or revision.

In the case of the Johnson Matthey Silver Medal and the Westinghouse Brake and Signal Co. Ltd. Prize, both members and non-members of the Institute are equally eligible, and papers should be submitted direct to the Institute at 32 Great Ormond Street, London, W.C.1.

BIBLIOGRAPHY ON INDUSTRIAL DRYING

IN three volumes, the Department of Scientific and Industrial Research have produced an extensive bibliography of references to industrial drying.

Although published in three volumes, there are really five sections, dealing with principles of drying, drying processes and equipment, agriculture, food and industrial materials.

In turn, these sections are subdivided to cover basic information, instrumentation and the practical aspects of the job in question. In all there are 1,768 individual references to publications and, since drying is an important aspect of practically every industry, the three volumes afford an excellent gallery of references up to 1950.

Institute of Metal Finishing.—The offices of the Institute are now situated at the following address: 32 Great Ormond Street, Holborn, London, W.C.1. Telephone: CHAncery 6793.

Surface Protection Ltd.—In the July issue, on page 957, reference was made to the well-known rust preventative Sozol which due to a printer's error was reproduced as "Sayol."

APPOINTMENT VACANT

LEWIS BERGER (Gt. Britain) Ltd., require a Manager for their Cellulose Production Unit at Chadwell Heath, Essex. Ability to organise increasing production and knowledge of cellulose lacquer field essential. Excellent opportunities for the right candidate. Please write for interview stating experience to Personnel Officer, 38 Berkeley Square, W.1.

STYRENE CO-POLYMERS LTD.

FOUR years ago this company was formed jointly by Petrochemicals Ltd., and Lewis Berger and Sons Ltd., to operate the styrene co-polymer patents owned by the Berger organisation and to manufacture the co-polymers and alkyd resins from a styrene distillate fraction of the Catarole process of cracking petroleum operated by Petrochemicals Ltd.

Bulk manufacture began in June, 1951, and now it is announced that Pinchin, Johnson and Associates Ltd., have entered into the partnership. The new board will consist of Mr. W. T. Branscombe and Mr. T. S. Dally, respectively managing director and assistant managing director of Pinchin, Johnson and Associates Ltd. Other directors are Mr. G. H. Owtram and Mr. Michael Colefax, who represent the Petrochemicals interests, and Mr. W. J. Darby and Mr. C. G. Fry, who represent the Berger interests. Mr. Rudolph de Trafford is chairman and Mr. Eric A. Bevan is managing director.

The passing of the patents in the styrene field held by Pinchin, Johnson and Associates Ltd., into Styrene Co-Polymers Ltd., will strengthen the project considerably. The company's intention is to rationalise the manufacture of synthetic media and to enter into very large-scale production of a limited number of types, with consequent economy in handling and storage. Large-scale requirements of two of the firms will facilitate this job. On order for Styrene Co-Polymers Ltd., is a 4,500 gal. Reacter for styrenated alkyds.

One cannot help feeling that this kind of merger shows that so-called "private" enterprise is becoming very much "public" enterprise, without the dead hand of the bureaucrat holding the control.

METACON 516

CRODA Ltd., Snaith, Goole, Yorkshire, have published a brochure dealing with this concentrated rust-remover. The major claim for the material is its de-rusting action combined with the imparting of a film claimed to be resistant to corrosion. The final surface is suitable for painting and finishing generally.

The material is available in the concentrated and dilute form. It is not claimed as a long term corrosion resistant coating, but mild steel panels treated with Metacon 516 have remained free from rust up to eight weeks in an atmosphere which was both acidic and sulphurous. The use of the material is described, the precautions necessary and storage conditions.

Sturtevant Literature.—Publication No. 3,201 on "Axial Flow Fans" is available from Sturtevant Engineering Co. Ltd., Southern House, Cannon Street, London, E.C.4. Physical data on these aerofoil blade fans are given and their performance characteristics. Illustrations and line diagrams are provided together with information needed when ordering.

Ionic Plating Co. Ltd.—Referring to the above company, we mentioned in the July issue of INDUSTRIAL FINISHING that the Ionic Works is "claimed to be the largest production plating works in the world." However, the Ionic Plating Co. Ltd. tell us that they make no such claim, but merely that they are "one of the largest." At any rate they are pretty big and undertake some pretty extensive business.

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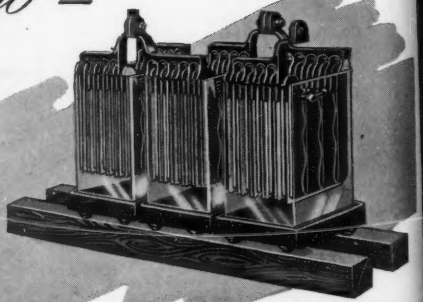

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